ILLINOIS
AGRICULTURAL HANDBOOK

Illinois Agricultural Handbook

Compiled by the Agricultural Extension Service, University of Illinois, and the Illinois Association of Farm Advisers

Printed in furtherance of the Agricultural Extension Act of May 8, 1914.
W. F. Handschin, Vice-Director

Published by Agricultural Extension Service, University of Illinois, Urbana, 1921

INTRODUCTION

The compilation of a reference work containing accurate, brief and readily available information for the farm advisers of Illinois has been the aim of those who are responsible for this book.

The method of procedure followed in making up this book was in accordance with the plan outlined below.

A committee consisting of the State Leader of Farm Advisers, the Departmental Advisers of the University of Illinois, and the President of the Advisers' Association was selected to consider the preparation of the book. Each Farm Adviser was requested by the State Leader of Farm Advisers and the President of the Illinois State Association of Farm Advisers to send to the Agricultural Extension Service an outline of the material which he thought should be included. Each Departmental Adviser then compiled the suggestions concerning his subject and prepared a general outline of the material to be submitted by his department. This material was then considered by the Farm Advisers' Committee for that department and the Department Head, and changes were made in accordance with their suggestions. The Departmental Advisers revised the material and submitted the copy to the Agricultural Extension Service where it was considered as a whole and finally put into book form.

Those who cooperated in the compilation and publishing of this book are:

1. The Agricultural Extension Service including
   - The Administrative Staff
   - The State Leader and Assistant State Leaders
   - The Departmental Advisers in Soils, Crops, Animal Husbandry, Dairy Husbandry, Entomology, Horticulture and Farm Management.
2. The Illinois Association of Farm Advisers including
   - The President
   - Members of the Committees on Soils, Crops, Animal Husbandry, Dairy, Entomology, Horticulture and Farm Management.

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Bureau of Entomology....L. O. Howard, Entomologist
Bureau of Biological Survey.....E. W. Nelson, Chief
Bureau of Public Roads.....T. H. McDonald, Director
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.....H. C. Taylor, Chief

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.....In Charge Boys and Girls Club Work
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.....In Charge Farm Management Demonstrations
A. B. Graham.....In Charge
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Virginia	Blacksburg
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Wisconsin	Madison
Wyoming	Laramie

Note: Directors of Extension, and Directors of Experiment Stations are located in the same town in most of the states. Where they are apart, the second town given (in italics) is the location of the Experiment Station. Names of Directors are not given because of frequent changes of personnel.

Fertility in Illinois Soils

Average pounds per acre in Surface Soil (0-6⅔ inches)

Soil Area or Glaciation	Soil Type	Total Nitrogen	Total Phosphorus	Total Potassium	Limestone Requirement in tons
	Prairie Soils				
Lower Illinoian	Gray silt loam on tight clay	2880	840	24940	4 to 5
Illinoian	Brown silt loam	4605	1185	32590	2 to 4
Wisconsin	Brown silt loam	5900	1300	40635	1 to 2
Illinoian	Black clay loam	6085	1560	30765	0 to 2
Wisconsin	Black clay loam	8370	1950	36255	Rarely
	Upland Timber Soils, Undulating				
Unglaciated	Yellow gray silt loam	1520	870	29150	4 to 5
Lower Illinoian	Yellow gray silt loam	2090	510	32850	4 to 5
Illinoian	Yellow gray silt loam	2300	865	36165	3 to 4
Wisconsin	Yellow gray silt loam	2635	905	38365	2 to 3
	Upland Timber Soils, Broken				
Unglaciated	Yellow silt loam	1890	950	31450	4 to 5
Lower Illinoian	Yellow silt loam	2150	950	31850	4 to 5
Illinoian	Yellow silt loam	2940	830	68330	3 to 4
Wisconsin	Yellow silt loam	1735	790	41220	2 to 4
Iowan	Brown sandy loam	3070	850	26700	2 tons
Deep Loess	Yellow fine sandy loam	2170	960	35640	3 to 4
	Sand, Swamp, and Bottom Soils				
Old bottom	Deep gray silt loam	3630	1420	36360	3 to 4
Late bottom	Deep brown silt loam	4720	1620	39970	Rarely
Sand Soils	Plains and dunes	1440	820	30880	4 to 5
Late Swamp	Deep peat	34880	1960	2930	Rarely

Annually Available Fertility in Illinois Soils, Pounds per Acre

(As a rough estimate the equivalent of 2 per cent of the nitrogen, 1 per cent of the phosphorus, and ¼ of 1 per cent of the potassium may be considered as possible of liberation during the growing season by practical methods of farming.)

Soil Type	Available Nitrogen	Available Phosphorus	Available Potassium	Maximum Crop Corn possible to produce
Gray silt loam on tight clay	58	*8.4	62	36 Bu.
Brown silt loam	101	*12.3	90	52
Black clay loam	145	*17.6	84	75
Yellow gray silt loam (unglaciated)	*30	8.7	73	20
Yellow gray silt loam (Lower Illinois)	42	*5.1	82	22
Yellow silt loam (Corn Belt)	*48	8.8	93	32
Yellow silt loam (Unglaciated)	*38	9.5	79	25
Yellow silt loam (Lower Illinois)	*43	9.5	80	29
Yellow silt loam (Corn Belt)	*39	8.3	93	26
Brown sandy loam (Iowan)	61	*8.5	67	36
Yellow fine sandy loam (Deep loess)	*43	9.6	89	29
Deep gray silt loam	*72	14.	91	48
Deep brown silt loam	*94	16.	100	63
Sand plains and dunes	*29	8.	77	19
Deep Peat	?	20.	*7	10

*The limiting element of plant food.

Fertility in Farm Produce

Approximate maximum amounts removable annually

PRODUCE			POUNDS PER ACRE		
Kind	Amount		Nitrogen	Phosphorus	Potassium
Corn, grain	100	bu.	100	17.	19
Corn, stover	3	tons	48	6.	52
Corn, cobs	1000	lbs.	2	.5	2
Oats, grain	100	bu.	66	11	16
Oats, straw	2½	tons	31	5	52
Wheat, grain	50	bu.	71	12	13
Wheat, straw	2½	tons	25	4	45
Barley, grain	75	bu.	59	13	14
Barley, straw	2½	tons	33	4	45
Rye, grain	50	bu.	51	11	14
Rye, straw	2½	tons	21	6	37
Clover seed	4	bu.	7	2	3
Clover hay	4	tons	160	20	120
Soybean seed	25	bu.	80	13	24
Soybean straw	2¼	tons	79	8	49
Alfalfa hay	8	tons	400	36	192
Cowpea hay	3	tons	130	14	98
Timothy hay	3	tons	72	9	71
Red Top hay	2	tons	42	6	32
Sugar beets	20	tons	100	18	157
Potatoes	300	bu.	63	13	90
Apples	600	bu.	47	5	57
Apple, leaves	4	tons	59	7	47
Apple, tree-growth	1/50	tree	6	2	5
Fat cattle	1000	lbs.	25	7	1
Fat hogs	1000	lbs.	18	3	1
Milk	10000	lbs.	57	7	12
Butter	500	lbs.	1	0.2	0.1

Fertility in Manure, Rough Feeds and Fertilizers

Name of Material	POUNDS PER TON		
	Nitrogen	Phosphorus	Potassium
Fresh farm manure	10	2	8
Ordinary farm manure	10	3	8
Corn stover	16	2	17
Oat straw	12	2	21
Wheat straw	10	2	19
Barley straw	13	2	18
Rye straw	8	2	15
Clover hay	40	5	30
Cowpea hay	43	5	33
Alfalfa hay	50	4	24
Sweet clover hay (mature)	38	4	24
Dried Blood	280	...	...
Sodium Nitrate	310	...	...
Ammonium Sulfate	400	...	...
Raw bone meal	80	180	...
Steamed bone meal	20	250	...
Raw rock phosphate	...	260	...
Acid phosphate	...	125	...
Basic slag phosphate	...	160	...
Potassium chlorid	...	...	850
Potassium sulfate	...	...	850
Kainit	...	...	200
Omaha potash	...	...	460
*Wood ashes (unleached)	...	10	100
Complete fertilizer (2-8-2)	33	70	33

*Wood ashes also contain 1000 lbs. calcium carbonate.

Essential Elements of Plant Food

Element	Source	Atomic Weight	Per cent in the kernel of corn
Oxygen	Air	16	46.000
Carbon	Air	12	45.000
Hydrogen	Water	1	6.400
Nitrogen	Soil	14	1.760
Phosphorus	Soil	31	.300
Potassium	Soil	39	.340
Calcium	Soil	40	.022
Magnesium	Soil	24.3	.125
Sulfur	Soil	32	.004
Iron	Soil	56	.008

Conversion Factors for Fertilizing Materials

The following	Multiplied by the factor	Gives the following
Nitrogen N	1.2143	Ammonia NH_3
Ammonia NH_3	.8235	Nitrogen N
Phosphorus P	2.2903	Phosphoric Acid P_2O_5
Phosphoric Acid P_2O_5	.4366	Phosphorus P
Bone phosphate of lime $Ca_3(PO_4)_2$	5.0000	Phosphorus P
Phosphorus P	.2000	Bone phosphate of lime $Ca_3(PO_4)_2$
Bone phosphate of lime $Ca_3(PO_4)_2$	2.1831	Phosphoric Acid P_2O_5
Phosphoric Acid P_2O_5	.4581	Bone phosphate of lime $Ca_3(PO_4)_2$
Potassium K	1.2064	Potash K_2O
Potash K_2O	.8300	Potassium K
Calcium Oxid CaO	1.7857	Calcium Carbonate $CaCO_3$
Calcium Carbonate $CaCO_3$	.5600	Calcium Oxid CaO
Magnesium Carbonate $MgCO_3$	1.1862	Calcium Carbonate $CaCO_3$
Calcium Carbonate $CaCO_3$	.8430	Magnesium Carbonate $MgCO_3$

Crop Yields, Davenport Plots, University North Farm, Urbana, Illinois

(Brown Silt Loam)

Crop Rotation—Corn, Oats, Clover, Wheat, Alfalfa

Soil Treatment	Corn Bu. 21 crops	Oats Bu. 19 crops	Clover tons or Bu. 14 crops	Wheat Bu. 9 crops	Alfalfa tons 9 crops
None	56.5	47.0	2.07	24.9	2.34
Residues	56.5	48.9	1.88	28.2	2.31
Manure	64.8	54.0	2.24	26.8	2.33
RL	61.1	51.2	1.97	30.5	2.56
ML	68.1	56.0	2.51	32.0	2.92
RLP	75.6	63.3	2.44	42.2	3.66
MLP	73.3	63.2	3.13	38.8	3.69
RLPK	75.8	64.1	1.63	40.2	3.69
MLPK	72.3	62.5	2.64	38.5	3.68
Gains for L with R..	4.6	2.3	.09	2.3	.25
Gains for L with M..	3.3	2.0	.27	5.2	.59
Gains for P with R..	14.5	12.1	.47	11.7	1.10
Gains for P with M..	5.2	7.2	.62	6.8	.77

Note: The yields of clover on the residue plots are expressed in bu. of seed.

Key—R = residue; L = limestone; M = manure; P = phosphorus; K = potassium.

Crop Yields—Ewing Soil Field

(Gray Silt Loam on Tight Clay)

Crop Rotation—Corn, Oats, Clover, Wheat

Soil Treatment	Corn, Bu. 9 crops	Oats, Bu. 9 crops	Clover tons or Bu. 6 crops	Wheat, Bu. 6 crops
None	14.8	12.5	.29	2.8
Manure	24.6	15.4	.36	4.6
ML	36.7	28.2	.90	15.4
MLP	37.1	31.4	1.10	19.1
Residues	14.3	14.1	.13	1.9
RL	31.6	30.3	.72	14.7
RLP	31.1	31.6	.91	16.7
RLPK	38.9	35.9	.95	22.4

Note: The yields of clover on the residue plots are expressed in bu. of seed.

Crop Yields—Enfield Soil Field

(Yellow Gray Silt Loam)

Crop Rotation—Corn, Oats, Clover, Wheat

Soil Treatment	Corn, Bu. 6 crops	Oats, Bu. 6 crops	Clover tons or Bu. 5 crops	Wheat, Bu. 4 crops
None	21.7	15.8	.38	6.4
Manure	25.0	17.3	.45	5.7
ML	35.7	23.5	1.18	17.3
MLP	37.8	23.6	1.29	18.9
Residues	21.2	15.8	.23	7.5
RL	34.3	25.6	.88	17.3
RLP	36.1	29.4	.97	24.2
RLPK	41.4	31.9	.82	23.1

Note: The clover yields on the residue plots are expressed in bu. of seed.

Effect of Cropping Systems on the Crop Yields

Morrow Plots, Urbana, Illinois

(Brown Silt Loam)

Cropping System	Corn. bushels			Oats, bushels			Clover, tons		
	1888 1919	1888 1903	1904 1919	1888 1919	1888 1903	1904 1919	1888 1919	1888 1903	1904 1919
Corn (Continuously)	33.1	39.7	26.5	....	....	....	....	....	....
Corn and Oats	40.3	41.0	39.5	38.3	44.0	34.0	....	....	....
Corn, Oats, Clover	50.0	48.0	51.4	44.6	47.6	42.2	1.94	2.03	1.87
Av. Yield Champaign County	....	....	40.0	....	....	42.3	....	....	1.52
Av. Yield ..... County	....	....	....	....	....	....	....	....	....

Note: These cropping systems have been under observation since 1879, but the yields have been taken only since 1888, or 32 years.

Yields of Corn—Results Due to Tillage

Method of Tillage and Treatment	Brown silt loam, Urbana 6 year average	Gray silt loam on tight clay, Fairfield 3 year average
1 Not plowed or cultivated; weeds kept down by scraping with hoe	33.0 bushels	10.0 bushels
2 Plowed, seed bed prepared; no cultivation; weeds kept down by scraping with hoe	47.3 bushels	31.5 bushels
3 Plowed, seed bed prepared; weeds allowed to grow	5.3 bushels	10.5 bushels
4 Plowed, seed bed prepared; cultivated shallow three times	42.9 bushels	31.2 bushels
5 Plowed, seed bed prepared; cultivated shallow three times; irrigated	52.3 bushels	.....
6 Plowed, seed bed prepared; cultivated shallow three times; irrigated; fertilized	76.2 bushels	*45.4 bushels

*Not irrigated. See Illinois Bulletin 181.

Value of a Ton of Limestone

In terms of increased crop yields during one 4-year rotation

Experiment Field	Corn $1.00 per bu.	Oats 60c per bu.	Wheat $1.50 per bu.	Clover $15.00 per ton or bu.	Total value of 1 ton limestone
Mt. Morris	2.90	–.45	2.05	.115	$7.43
Carthage	2.90	2.10	1.65	.030	7.09
Urbana	1.95	1.05	1.90	.090	6.78
Carlinville	4.00	1.90	3.20	.300	14.44
Sparta	1.45	*1.55	5.35	.535	19.68
Oblong	3.55	3.85	3.00	.400	16.36
Ewing	7.35	7.25	5.90	.280	24.75
Enfield	5.95	4.00	5.35	.345	21.55
Av. of corn belt soils	2.94	1.15	2.20	.134	8.94
Av. of southern Illinois soils	4.58	5.03	4.88	.390	20.59

*Soybeans.

Increased Crop Yields from the Use of Limestone

(2 tons per acre once in 4 years)

Experiment Field	Soil Treatment	Corn bu.	Oats bu.	Wheat bu.	Clover Tons or bu.
Mt. Morris (Brown silt loam)	OM†	54.2	67.0	21.8	1.76
	OML	60.0	66.1	25.9	1.99
Carthage (Brown silt loam)	OM	36.8	36.0	23.7	1.63
	OML	42.6	40.2	27.0	1.69
Urbana (Brown silt loam)	OM	60.7	51.5	27.5	2.06
	OML	64.6	53.6	31.3	2.24
Carlinville (Brown silt loam)	OM	33.9	37.7	18.2	1.41
	OML	41.9	41.5	24.6	2.01
Sparta (Yellow gray silt loam)	OM	14.3	*9.3	8.4	.42
	OML	17.2	*12.4	18.9	1.49
Oblong (Gray silt loam tight clay)	OM	24.6	32.5	13.6	.84
	OML	31.7	40.2	19.6	1.64
Ewing (Gray silt loam tight clay)	OM	19.5	14.8	3.3	.25
	OML	34.2	29.3	15.1	.81
Enfield (Yellow gray silt loam)	OM	23.1	16.6	6.6	.34
	OML	35.0	24.6	17.3	1.03
Av. gain corn belt soils		5.9	2.3	4.4	.27
Av. gain southern Illinois soils		9.2	10.1	9.8	.81

*Soybeans.

†OM (organic manures) includes average of all residues, green manures and farm manures.

Value of a Ton of Raw Rock Phosphate

In terms of increased crop yields during one 4-year rotation

Experiment Field	Corn $1.00 per bu.	Oats 60c per bu.	Wheat $1.50 per bu.	Clover $15.00 per ton or bu.	Total value of 1 ton phosphate
Mt. Morris	2.1	2.1	2.7	.02	$7.71
Carthage	5.2	3.5	1.6	.27	13.75
Urbana	9.9	9.7	9.2	.55	37.77
Carlinville	1.8	1.6	1.5	−.16	2.61
Sparta	.8	*.2	1.7	.04	4.25
Oblong	2.7	3.3	5.2	.24	16.08
Ewing	−.1	2.2	2.8	.20	8.42
Enfield	2.0	1.9	4.3	.10	11.09
Av. of corn belt soils	4.75	4.23	3.75	.17	15.46
Av. of southern Ill. soils	1.35	2.47	3.50	.145	10.26

*Soybeans.

Note: At least 85% of the phosphorus in the ton of raw rock still remains in the corn belt soils and 90% in the southern Ill. soils.

Value of a Ton of Ordinary Farm Manure

Expressed in terms of increased crop yields during one 4-year rotation

Experiment Field	Corn $1.00 per bu.	Oats 60c per bu.	Wheat $1.50 per bu.	Clover $15.00 per ton	Total value of 1 ton manure
Mt. Morris	1.381	.686	.138	.034	$2.51
Carthage	.956	.600	.340	.066	2.82
Urbana	.792	.668	.181	.016	1.70
Carlinville	1.284	1.188	.273	.000	2.40
Raleigh	2.511	1.464	.274	.082	5.03
Oblong	1.480	1.990	*1.837	.046	6.12
Ewing	2.178	.664	.400	.020	3.46
Enfield	.780	.403	−.188	.019	1.02
Av. of corn belt soils	1.103	.786	.233	.029	2.36
Av. of southern Ill. soils	1.737	1.125	.581	.042	3.91

Note: Ordinarily the manure is applied to the corn crop. In the case of the Oblong field, the manure was applied to the wheat crop on one occasion.

Increased Crop Yields from the Use of Rock Phosphate

(1 ton per acre once in 4 years)

Experiment Field	Soil Treatment	Corn bu.	Oats bu.	Wheat bu.	Clover Tons or bu.
Mt. Morris (Brown silt loam)	OML	60.0	66.1	25.9	1.99
	OMLP	62.1	68.2	28.6	2.01
Carthage (Brown silt loam)	OML	42.6	40.2	27.0	1.69
	OMLP	47.8	43.7	28.6	1.96
Urbana (Brown silt loam)	OML	64.6	53.6	31.3	2.24
	OMLP	74.5	63.3	40.5	2.79
Carlinville (Brown silt loam)	OML	41.9	41.5	24.6	2.01
	OMLP	43.7	43.1	26.1	1.85
Sparta (Yellow gray silt loam)	OML	17.2	*12.4	18.9	1.49
	OMLP	18.0	*12.6	20.6	1.53
Oblong (Gray silt loam tight clay)	OML	31.7	40.2	19.6	1.64
	OMLP	34.4	43.5	24.8	1.88
Ewing (Gray silt loam tight clay)	OML	34.2	29.3	15.1	.81
	OMLP	34.1	31.5	17.9	1.01
Enfield (Yellow gray silt loam)	OML	35.0	24.6	17.3	1.03
	OMLP	37.0	26.5	21.6	1.13
Average gain on corn belt soils		4.75	4.23	3.75	.170
Average gain on southern Ill. soils		1.35	2.47	3.50	.145

*Soybeans.

OM (organic manures) includes average of all residues, green manures and farm manures.

Increased Crop Yields from the Use of Farm Manure

Experiment Field	Soil Treatment	Corn bu.	Oats bu.	Wheat bu.	Clover Tons
Mt. Morris (Brown silt loam)	O	43.2	61.6	20.2	2.12
	M	57.3	68.6	21.6	2.47
Carthage (Brown silt loam)	O	29.4	31.0	21.5	1.75
	M	35.3	34.7	23.6	2.16
Urbana (Brown silt loam)	O	56.5	47.0	24.9	2.07
	M	64.8	54.0	26.8	2.24
Carlinville (Brown silt loam)	O	27.8	31.5	17.6	1.29
	M	35.8	38.9	19.3	1.28
Raleigh (Yellow gray silt loam)	O	18.2	11.6	6.4	.27
	M	30.1	13.8	7.7	.66
Oblong (Gray silt loam tight clay)	O	19.5	24.5	8.5	.71
	M	25.3	32.3	15.7	.89
Ewing (Gray silt loam tight clay)	O	14.8	12.5	2.8	.32
	M	24.6	15.4	4.6	.41
Enfield (Yellow gray silt loam)	O	21.3	15.8	6.4	.38
	M	24.3	17.3	5.7	.45
Av. gain on corn belt soils		9.1	6.3	1.8	.21
Av. gain on southern Illinois soils		7.6	3.6	2.4	.18

O=no treatment.
M=manure.

Increased Crop Yields from the Use of Potassium

Experiment Field	Soil Treatment	Corn bu.	Oats bu.	Wheat bu.	Clover tons
Tampico	O	00.0	....	....	....
(Peaty Swamp)	K	41.6	....	....	....
Old Manito	O	14.7	....	....	....
(Deep Peat)	K	41.6	....	....	....
New Manito	O	11.6	33.5	13.1	....
(Peaty Alkali)	K	40.8	42.2	21.9	....
Old Momence	O	5.8	16.3	....	....
(Peaty Swamp)	K	37.2	21.6	....	....
New Momence	O	12.8	32.5	....	.41
(Peaty Swamp)	K	35.1	32.0	....	.50

Note: Approximately 150 pounds of Potassium Chloride (Muriate of Potash) were applied per acre per year.
O=no treatment.
K=potassium.

Fertility in Soils of.....County

Average Pounds per Acre in Surface Soil

(O-6⅔ inches) (To be filled in by County Adviser)

Soil Type	Total Nitrogen	Total Phosphorus	Total Potassium	Limestone Requirement

Soil Treatment

I. Illinois Corn Belt.

1. Phosphorus—½ to 1 ton raw rock phosphate per acre as an initial application, then ½ ton per acre per rotation thereafter.
2. Limestone—2 tons per acre per rotation.
3. Organic Manure—Farm manure, crop residues, and legume green manure.

II. Southern Illinois Wheat Belt.

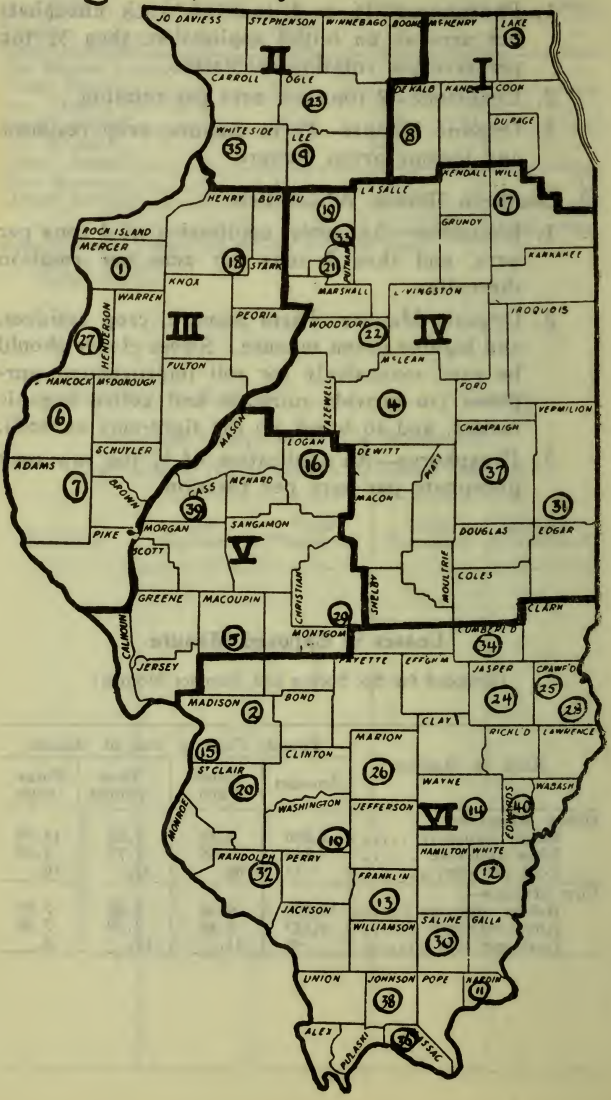
1. Limestone—An initial application of 4 tons per acre, and then 2 tons per acre per rotation thereafter.
2. Organic Manure—Farm manure, crop residues, and legume green manure. Sweet clover should be used extensively for soil improvement purposes (to provide nitrogen and active organic matter, and to break up the tight-clay subsoil).
3. Phosphorus—An application of ½ ton raw rock phosphate per acre per rotation.

Losses in Exposed Manure

(Exposed for Six Spring and Summer Months)

Kind of Manure	Pounds Each in Ton of Manure			
	Amount	Nitrogen	Phosphorus	Potassium
Horse Manure—				
Before exposure	4,000	9.80	3.25	14.94
After exposure	1,730	3.89	1.71	3.59
Loss per cent	57	60.	47.	76.
Cow Manure—				
Before exposure	10,000	9.40	2.82	7.97
After exposure	5,125	5.60	2.29	7.30
Loss per cent	49	41.	19.	8.

Illinois Cropping Areas
Agronomy Experiment Fields



Illinois Cropping Areas

I. N. East—Late Wisconsin and small portion of the Early Wisconsin glaciations.

II. N. West—Practically identical with the Iowan glaciations and the unglaciated portion of Jo Daviess County.

III. W. Central—Practically identical with the Upper Illinois glaciation.

IV. E. Central—Practically identical with the Early Wisconsin glaciation.

V. S. W. Central—Nearly all of the Middle Illinois glaciation and the unglaciated Calhoun County.

VI. Southern—Includes a small portion of the middle Illinois glaciation, all of the Lower Illinois glaciation, and the unglaciated region of the extreme southern part of the state.

Agronomy Experimental Fields

No.	Location	County
1.	Aledo	Mercer
2.	Alhambra	Madison
3.	Antioch	Lake
4.	Bloomington	McLean
5.	Carlinville	Macoupin
6.	Carthage	Hancock
7.	Clayton	Adams
8.	DeKalb	DeKalb
9.	Dixon	Lee
10.	DuBois	Washington
11.	Elizabethtown	Hardin
12.	Enfield	White
13.	Ewing	Franklin
14.	Fairfield	Wayne
15.	Granite City	Madison
16.	Hartsburg	Logan
17.	Joliet	Will
18.	Kewanee	Henry
19.	LaMoille	Bureau
20.	Lebanon	Saint Clair
21.	McNabb	Putnam
22.	Minonk	Woodford
23.	Mt. Morris	Ogle
24.	Newton	Jasper
25.	Oblong	Crawford
26.	Odin	Marion
27.	Oquakwa	Henderson
28.	Palestine	Crawford
29.	Pana	Christian
30.	Raleigh	Saline
31.	Sidell	Vermilion
32.	Sparta	Randolph
33.	Spring Valley	Bureau
34.	Toledo	Cumberland
35.	Union Grove	Whiteside
36.	Unionville	Massac
37.	Urbana	Champaign
38.	Vienna	Johnson
39.	Virginia	Cass
40.	West Salem	Edwards

A Comparison of Different Carriers of Phosphorus

Odin Soil Experiment Field

Crop	No Phosphorus	Steamed bone meal	Acid phosphate	Raw rock phosphate	Basic Slag phosphate
Corn (4 crops)	20.0	24.8	23.1	22.9	22.8
Oats (3 crops)	44.2	49.4	48.2	50.3	53.0
Mixed hay (9 crops)	.92	1.30	1.03	1.06	1.10
Average value per crop	$17.74	$22.73	$19.89	$20.33	$20.94
Rate of application		213 lbs.	356 lbs.	711 lbs.	278 lbs.
Cost of application		$ 4.69	$ 4.98	$ 4.27	$ 3.89
Net value per crop	$17.74	18.04	14.91	16.06	17.05

Mascoutah Soil Experiment Field

Corn (4 crops)	38.9	47.0	42.1	46.4	46.7
Oats (2 crops)	34.0	40.6	39.6	38.2	38.4
Wheat (2 crops)	23.0	26.2	25.6	26.5	26.1
Average value per crop	$26.54	$31.53	$29.27	$31.09	$31.12
Rate of application		199 lbs.	245 lbs.	637 lbs.	226 lbs.
Cost of application		$ 4.38	$ 3.43	$ 3.82	$ 3.16
Net value per crop	$26.54	27.15	25.84	27.27	27.96

Cutler Soil Experiment Field

Corn (4 crops)		35.4	36.0	42.2	
Oats (4 crops)		27.1	28.8	24.6	
Clover (4 crops)		1.31	1.36	1.77	
Wheat (4 crops)		29.0	33.1	30.7	
Average value per crop		$28.70	$30.83	$32.39	
Rate of application		216 lbs.	383 lbs.	582 lbs.	
Cost of application		$ 4.75	$ 5.16	$ 3.49	
Net value per crop		23.95	25.67	28.90	

Note: Crops valued at $1.00 per bu. for corn; 60c for oats; $1.50 for wheat; and $15.00 per ton for hay. The fertilizers valued at $44.00 per ton for steamed bone meal; $28.00 for acid phosphate and basic slag, and $12.00 for the raw rock.

Soy Beans

Five-Year (1938-1942) Average Yields

Variety	No. Ill. Yield	Pct. Oil*	Cent. Ill. Yield	Pct. Oil*	So Y
Richland	27.6	20.2	28.5		
Mukden	25.2	19.5	30.1		
Mandell	25.0	19.1	33.1		
Dunfield	23.1	20.8	33.4	21.5	
Illini	24.1	20.3	32.6	20.6	
Chief			32.3	21.0	
Mt. Carmel			33.8		
Patoka			36.4	21.1	
Macoupin			----		
Scioto			30.7	21.5	
Richland*	29.9	20.2	35.1		
Earlyana*	27.9	20.0	29.7		
Lincoln*	38.6	21.4	47.8		
Dunfield*	31.8	20.8	37.7		
Illini*	32.2	20.3	35.9		

1. Amount of seed required is reduced at least 50 percent.

2. Yields have been greater.
Experiments on rate and method of seeding soybeans in Illinois (6-year average) show that Illini beans sown in 24-inch rows at 50 to 70 pounds per acre produced 32.7 bushels compared with 28.0 bushels for the same variety drilled in 8-inch rows at rates of from 90 to 130 pounds per acre.

The Ohio Experiment Station compared different rates and methods of seeding three varieties of soybeans at three locations in the state during the season of 1941. The following table summarizes the Ohio data:

Ohio Exp. Sta. (3 locations--1941) (21-inch rows used as 100%)

Spacing	Richland	Scioto	Mingo
21 inches	21.8 bu. 100.0	24.1 bu. 100.0	19.4 bu. 100.0
28 inches	88.9	95.5	94.8
35 inches	84.4	94.2	92.3
42 inches	81.3	86.4	95.7
Drilled	71.5	78.5	81.0

3. Soybeans grown in rows usually have fewer weeds and better seed quality.

4. Row-planted beans can be seeded before corn is planted and weeds can still be kept under control. Soybeans tend to loosen the soil and increase the danger of erosion. On soils subject to erosion, soybeans should be sown on the contour, and if possible a winter cover crop should be seeded in the soybean stubble to reduce the danger of soil loss.

5. Soybeans do best on good soils. The following data from the University of Illinois Soil Experiment Fields show the effect of soil treatment upon the yield of soybeans:

Soil experiment fields--4-year average ending in 1941				
Treatment*	Light-colored soils		Dark soils	Sandy soils
	Newton	Oblong	Joliet	Oquawka
	bu.	bu.	bu.	bu.
None	8.3	11.7	24.4	10.5
M	14.1	17.6	27.3	14.0
ML	20.2	23.7	28.5	16.8

* M - Manure; L - Limestone.

6. Inoculation is cheap insurance. On most farms it pays to inoculate all soybean seed used.

Oats--Illinois farmers are facing problem of reducing acreage in some crops to make room for seeded increases, and it has been suggested that oat acreage be reduced.

Oats are frequently considered a low-profit crop, yet on a majority of Illinois farms they are the only nurse crop available. It behooves every farmer to do everything possible to increase their value.

New varieties and better cultural practices will help to increase yields; and with the development of a greater lodging resistance in oats, clover and grass seedings will have a better chance to survive.

If our feed production is to be maintained in 1945 and 1946, we should have 20-25 percent of our acreage in legumes for forage and soil improvement.

Three-Year (1941-1943) Average Yields on Experiment Fields

Variety	North	Central	South
Boone	61.4	64.0	26.1
Marion	53.3	65.3	29.2
Tama	59.8	69.5	28.0*
Vicland	61.5	67.0	22.4*
Columbia	43.5	55.3	29.5
Iowar	40.7	56.6	--

The most productive pasture on fertile soils in central and northern Illinois has been found to be a mixture of alfalfa (6-8 pounds) and bromegrass (10-12 pounds). Other good pasture and hay mixtures are as follows:

For Sweet Soils

	lbs.
Alfalfa	4
Red Clover	4
Alsike Clover	3
Timothy	4

For Sweet Soils

	lbs.
Sweet Clover	4
Alfalfa	4
Red Clover	4
Timothy	4

For Sweet Soils--Lower Fertility

	lbs.
Sweet Clover	6
Alsike Clover	3
Timothy	4

For Sweet to Slightly Sour--Lower Fertility

	lbs.
Mammoth Clover	4
Alsike Clover	2
Timothy	4
Lespedeza	5

Alfalfa and red clover are the two most popular hay legumes. For best growth, both require liberal quantities of phosphorus. A sweet soil is necessary, especially if the phosphorus content of the soil is relatively low. On most Illinois soils, applications of both limestone and phosphorus pay big dividends. The following table of results from two Illinois soil experiment fields illustrates the response of the two legumes to increased fertility:

Crops	Region of State	Variety or strain
Alfalfa	Northern	Ranger, Grimm, Cossack, Ladak, Northwestern Common
	Central	Ranger, Cossack, Grimm, Common: Northwestern or Kansas or Nebraska
	Southern	Common: Nebraska, Kansas or Oklahoma approved
Clover	Northern	Midland, Rahn, Letcher, Maxheimer
	Southern	Cumberland, Midland, Rahn, Letcher, Maxheimer, Havelka

Forage crop seed supplies in general are short. The following table gives the comparative production of the various crop seeds, the 1943 goal, and the carryover into 1943-44 in the United States.

Crop Rotations

I. Illinois Corn Belt.

1. Corn, Oats, Clover.
2. Corn, Oats, Clover, Pasture.
3. Corn, Corn, Oats, Clover.
4. Corn, Oats, Wheat, Clover.
5. Corn, Corn, Oats, Clover pasture, Alfalfa (5 year).

II. Southern Illinois Wheat Belt.

1. Corn, Soybeans, Wheat, Sweet Clover catch crop (3 year).
2. Corn, Soybeans, Wheat, Sweet Clover pasture.
3. Corn, Wheat, Wheat, Sweet Clover.
4. Corn, Wheat, Clover, Wheat, Sweet Clover for pasture or seed.

*5. Wheat (Sweet Clover catch crop), Soybeans, Rye or Wheat, Clover (sweet or red) (4 year).

*6. Wheat (Sweet Clover catch crop), Soybeans or Cowpeas, Sunflowers, Wheat, Rye, Sweet Clover (6 year).

*Note: For full list of crop rotations to be used in chinch bug infested area, see Ill. Extension Circular 39.

Seeding Table—Farm Crops

Crop Seed	Pounds per bu.	Number of seeds per gr.	Number of seeds per oz.	Amount of seed per acre Row	Amount of seed per acre Broadcast
Alfalfa	60	471[1]	13,352	4–6 lbs.	15 lbs.
Barley	48	56	1,575[6]	.....	60 lbs.
Bluegrass					
Kentucky	14	5,751[1]	163,041	.....	25† lbs.
Canada	14	5,965[1]	169,108	.....	15† lbs.
Brome Grass	14	328[1]	9,299	.....	10–14 lbs.
Broom Corn	30[3]	90	2,552	7–10 lbs.	.....
Buckwheat	52	39	1,105	.....	3–4 pks.
Clovers					
Alsike	60	1,561[1]	44,254	.....	4–6 lbs.
Crimson	60	286	8,125	.....	15 lbs.
Mammoth	60	637[1]	18,059	.....	8–10 lbs.
Red	60	637	18,059	.....	8–10 lbs.
Sweet	60	490[1]	13,892	.....	10–12 lbs.
White	60	1,743[1]	49,414	.....	4–6 lbs.
Corn (Shelled)	56	3	70	7–8 lbs.	.....
Cowpeas	60	7	200	20–30 lbs.	1 bu.
Black	60	5 or 6	149	30 lbs.	5 pks.
Red Ripper	60	5 or 6	151	27 lbs.	5 pks.
Clay	60	6 or 7	181	25 lbs.	1 bu.
Whippoorwill	60	7	195	25 lbs.	1 bu.
New Era	60	9 or 10	278	20 lbs.	1 bu.
Emmer	40[4]	20	567	.....	2 bu.
Field Peas	60[2]	7	200	.....	2 bu.
Flax	56	217	6,163	.....	56–75 lbs.

[1]–Ave. figures used by Ill. Dept. Agri. Seed Inspection.
[2]–Piper—"Forage Crops."
[3]–Varies from 30 lbs. in Ia. to 57 lbs. in Miss.
[4]–North Dakota.
[6]–Minnesota.
†–In mixtures, seldom seeded alone.

Seeding Table—Farm Crops (Continued)

Crop Seed	Pounds per bu.	Number of seeds per gr.	Number of seeds per oz.	Amount of seed per acre Row	Amount of seed per acre Broadcast
Meadow Fescue	20–30[2]	836[1]	23,700	.....	10–15 lbs.
Millets	50	511	14,487	1 pk.	2–4 pks.
Foxtail	50	478	13,551	.....	2–4 pks.
Barnyard, Japanese	50	287	8,136	.....	2–3 pks.
Broomcorn	50	182	5,160	.....	2–4 pks.
Oat Grass	10[2]	461[1]	13,549	.....	40 lbs.
Oats	32	55	1,549	.....	2–3 bu.
Orchard Grass	14	1,270[1]	36,005	.....	12–20 lbs.
Potatoes	60	....	.....	12–15 bu.	.....
Rape	50[5]	245[1]	6,946	2 lbs.	4 lbs.
Redtop	14	8,818	250,000	.....	8–10 lbs.
Rye	56	55	1,566[6]	.....	5 pks.
Rye Grass (Italian)	20[8]	510[1]	14,459	.....	35–40 lbs.
Sorghums—					
Nonsaccharine					
Kaffir	56	38	1,089	5–6 lbs.	50–60 lbs.
Milo	56	36	1,020	5–6 lbs.	50–60 lbs.
Saccharine					
Amber	56	51	1,437	8–10 lbs.	40 lbs.
Orange	56	52	1,468	8–10 lbs.	40 lbs.
Sumac	56	77	2,187	8–10 lbs.	40 lbs.
Soudan	32–44[2]	133	3,770	3–5 lbs.	20–25 lbs.

[1]–Ave. figures used by Ill. Dept. Agri. Seed Inspection.
[2]–Piper, "Forage Crops."
[5]–Wisconsin.
[6]–Minnesota.
[8]–Tennessee.

Seeding Table—Farm Crops (Continued)

Crop Seed	Pounds per bu.	Number of seeds per gr.	Number of seeds per oz.	Amount of seed per acre Row	Amount of seed per acre Broadcast
Soybeans	60				
Hollybrook	60	3 or 4	134	25–30 lbs.	75 lbs.
Morse	60	....	.....	25–30 lbs.	70 lbs.
Wilson	60	5 or 6	150	25 lbs.	65 lbs.
Ito San	60	7 or 8	202	25 lbs.	65 lbs.
A. K.	60	5 or 6	162	25 lbs.	65 lbs.
Med. Yellow	60	7 or 8	222	25 lbs.	60 lbs.
Mongol	60	9 or 10	262	25 lbs.	60 lbs.
Wisconsin Black	60	11 or 12	319	20 lbs.	60 lbs.
Peking	60	14 or 15	399	15–18 lbs.	50–60 lbs.
Timothy	45	2,791[1]	79,125	.....	12–15 lbs.
Velvet Beans	60	1 to 2	40	12–15 lbs.	.....
Vetch (Hairy)	60	34[1]	964	.....	20–25 lbs.
Vetch (Spring)	60	21[1]	595	.....	30–50 lbs.
Wheat	60	27	781[7]	.....	5–6 pks.

[1]–Ave. figures used by Ill. Dept. Agri. Seed Inspection. [7]–Duggar, "Southern Field Crops."

Seeding Table—Farm Crops (Continued)

Crop Seed	Time of seeding	Depth of Seeding	U. S. Standard % Purity	U. S. Standard % Germination
Alfalfa	Early spring with nurse crop; July 20 to Aug. 10 if seeded alone	¼"–1 "	98	85–90
Barley	Early spring	1 "–2 "	99	90–95
Bluegrass				
Kentucky	In fall—in mixtures	¼"–1 "	90	45–50
Canada	In fall—in mixtures	¼"–1 "	90	45–50
Brome Grass	Early spring or fall	¼"–1 "	90	75–80

Seeding Table—Farm Crops (Continued)

Crop Seed	Time of seeding	Depth of Seeding	U. S. Standard % Purity	U. S. Standard % Germination
Broom Corn	Late spring	1 "–3 "	*	*
Buckwheat	Late spring—early summer	1 "–2 "	99	90–95
Clovers				
Alsike	Early spring	¼"–1 "	95	75–80
Crimson	August-September	½"–1 "	98	85–90
Mammoth	Early spring or August	½"–1 "	98	85–90
Red	Early spring or August	½"–1 "	98	85–90
Sweet	Spring or August	½"–1 "	*	*
White	Spring or August	¼"–1 "	95	75–80
Corn (Shelled)	Late spring	1 "–3 "	99	90–95
Cowpeas	Late spring or early summer	1 "–2 "	99	85–90
Black	Late spring or summer	1 "–2 "	99	85–90
Red Ripper	Late spring or summer	1 "–2 "	99	85–90
Clay	Late spring or summer	1 "–2 "	99	85–90
Whippoorwill	Late spring or summer	1 "–2 "	99	85–90
New Era	Late spring or summer	1 "–2 "	99	85–90
Emmer	Early spring	1 "–2 "	*	*
Field Peas	Early in spring as possible	1½"–3 "	99	93–98
Flax	Late spring or early summer	½"–1 "	98[6]	94[6]
Meadow Fescue	August or spring	¼"–1 "	95	85–90
Millets	Late spring—early summer	1½"–2 "	99	85–90
Foxtail	Late spring—early summer	1 "–2 "	99	85–90
Barnyard, Japanese	Late spring—early summer	1 "–2 "	99	85–90
Broomcorn	Late spring—early summer	1 "–2 "	99	85–90
Oat Grass	Spring—early fall	1 "–1½"	95[6]	90[6]
Oats	Early spring	1½"–3 "	99	90–95

*–No standards given.

[6]–Minnesota.

Seeding Table—Farm Crops (Continued)

Crop Seed	Time of seeding	Depth of Seeding	U. S. Standard % Purity	U. S. Standard % Germination
Orchard Grass	Fall or very early spring	½"–1 "	94[6]	80[6]
Potatoes	Early spring	4 "–6 "	*	*
Rape	Very early spring	½"–1 "	99	90–95
Redtop	Fall or very early spring	½"	96[6]	90[6]
Rye	Fall	1 "–2 "	99	90–95
Rye Grass (Italian)	Fall or spring	½"–1 "	95[6]	85[6]
Sorghums— **Nonsaccharine**				
Kaffir	Spring or early summer	1 "–2 "	98	85–90
Milo	Spring or early summer	1 "–2 "	98	85–90
Saccharine				
Amber	Spring or early summer	1 "–2 "	98	85–90
Orange	Spring or early summer	1 "–2 "	98	85–90
Sumac	Spring or early summer	1 "–2 "	98	85–90
Soudan	Late spring	1 "–2 "	..	.....
Soybeans		.....	98[6]	95[6]
Hollybrook	Late spring or early summer	1 "–3 "	98[6]	95[6]
Morse	Late spring or early summer	1 "–3 "	98[6]	95[6]
Wilson	Late spring or early summer	1 "–3 "	98[6]	95[6]
Ito San	Late spring or early summer	1 "–2 "	98[6]	95[6]
A. K.	Late spring or early summer	1 "–2 "	98[6]	95[6]
Med. Yellow	Late spring or early summer	1 "–2 "	98[6]	95[6]
Mongol	Late spring or early summer	1 "–2 "	98[6]	95[6]
Wisconsin Black	Late spring or early summer	1 "–2 "	98[6]	95[6]
Peking	Late spring or early summer	1 "–2 "	98[6]	95[6]
Timothy	Early spring or fall	½"–1 "	98	85–90
Velvet Beans	Late spring or early summer	1½"–3 "	*	*
Vetch (Hairy)	Early spring or fall	1½"–2 "	99[6]	92[6]
Vetch (Spring)	Fall or early winter	1½"–2 "	*	*
Wheat	Fall or early spring	1½"–2 "	99	90–95

*–No standards given.

Seeding Table—Miscellaneous Crops

Kind of Seed	Rate of Seeding Pounds	Rate of Seeding Quarts	Method of Seeding	No. Acres One Bushel Will Seed	No. Seeds per Square Foot Average	No. Plants on Each Sq. Ft. at Perfect Stand[1]
Alfalfa	12-15	6-8	Broadcast	4 or 5	66.2	15
Barley	60	32-40	Drilled	¾ to 1	35.0	..
Kentucky Bluegrass*	15-25	34-54	Broadcast	½ to 1	1200	130
Canada Bluegrass	15	32	Broadcast	1	931	..
Brome grass	10-14	20-32	Broadcast	1 to 1¼	410	90
Broom corn	7-10	7-11	Rows	3 to 4	7.9	..
Buckwheat	40-52	24-32	Broadcast	¾ to 1	18.6	..
Clover Alsike	4-6	2 to 3	Broadcast	10 to 15	81.2	15
Crimson	15	8	Broadcast	4	44.7	15
Mammoth	8-10	4 to 6	Broadcast	6 to 8	59.7	15
Red	8-10	4 to 6	Broadcast	6 to 8	59.7	15
Sweet	10-12	6 to 7	Broadcast	5-6	56.1	..
White*	4-6	2 to 3	Broadcast	10 to 15	90.7	20
Cowpeas	60	32	Drilled	1	4.4	..
Emmer (Spelt)	80	64	Drilled	½	16.6	..
Field Peas	120	64	Drilled	½	8.8	..
Flax	56-75	32-40	Drilled	¾ to 1	14.8	..
Meadow Fescue*	10-15	13-19	Broadcast	2 to 2½	108.8	90
Millets	25-50	16-32	Drilled	1 to 2	199.5	..
Oat Grass*	40	128	Broadcast	¼	192.0	90
Oats	64-96	64-96	Broadcast	1/3 to 1/2	4.5	..
Orchard Grass	12-20	28-45	Broadcast	¾ to 1	211.5	90
Rape	4-5	2½-3½	Broadcast	10 to 12	11.4	..
Redtop*	8-10	17-22	Broadcast	1½ to 2	826.4	140
Rye	70	40	Drilled	4/5 to 1	4.0	..
Rye Grass*	35-40	56-64	Broadcast	1/3 to 1/2	199.1	90
Sorghums (Saccharin)	40	20-25	Drilled	1¼ to 1½	21.3	..
Soudan	20-25	20-25	Drilled	1¼ to 1¾	31.1	..
Soybeans (Med. Yel.)	60-75	30-40	Drilled	¾ to 1	5.5	..
Timothy	12-15	8-11	Broadcast	3 to 4	392.3	90
Velvet Beans	12-15	7-8	Rows	4 to 5	1.9	..
Vetch (Hairy)*	20-25	10-13	Broadcast	2½ to 3	7.9	..
Wheat	60-75	32-40	Rows	¾ to 1	19.3	..

*Generally seeded in mixtures, amount being correspondingly decreased.

[1]Piper, "Forage Plants and Their Culture."

Diseases of Farm Crops

Crop	Disease	Symptoms	Causative Organism	Control Measures
Alfalfa	Leaf Spot	Small brown or black spots visible on both sides of leaves	Pseudopeziza medicaginis	Mow to prevent loss of leaves
Alfalfa, Clover	Anthracnose	Gray elliptical sunken spots on the stems	Colletotrichum trifolii	Resistant Varieties; alsike clover is resistant
Alfalfa, Clover	Stem Rot	Rotting of plants at and just below the crown	Sclerotinia trifoliorum	Rotate crops avoiding alfalfa and clovers for from 4 to 6 yrs.
Barley	Stripe	Light yellow to brown stripes in the leaves	Helminthosporium gramineum	Treat seed with formaldehyde as for oat smut
Barley	Covered smut	Smutted mass replacing the interior of the kernel but covered by the thin epidermis of the grain	Ustilago hordei	Use clean seed, or treat with formaldehyde, using soaking and skimming method
Barley	Leaf blotch	Brown spots on the leaves, and seed	Helminthosporium sativum	Treat seed with formaldehyde as for oat smut
Barley	Loose smut	Entire head except the stem replaced by a smutted mass	Ustilago nuda	Modified hot water treatment (127° F for ten minutes)
Beans	Anthracnose	Dark colored sunken spots on leaves, stems and pods	Colletotrichum lindemuthianum	Use clean seed; cultivation while beans are wet spreads the disease where it is present.
Beans	Blight	Brown papery patches on leaves and watery ulcer-like spots on the pods	Pseudomonas phaseoli	Use clean seed; burn diseased plants; plant resistant varieties
Clover	(See Alfalfa)			
Corn	Root Rot	Blighted plants, delayed maturity, stunted stalk growth, barrenness, rotted broken shanks	Gibberella sp, Fusarium sp Verticillium sp Rhizopus sp Pseudomona sp	Proper field selection and storage of seed corn; germination test for detection of primary infection; resistant strains; crop rotation

Diseases of Farm Crops (Continued)

Crop	Disease	Symptoms	Causative Organism	Control Measures
Corn	Ear Rot	White or pink mold on ears	Diplodia zea Fusarium sp et al	Destroy infected ears and stalks; rotate crops with two years between corn crops
Corn	Bacterial Disease	Stunts and yellows plants and rots their roots; interior is brown and water-soaked; an exudate is usually present		Seed selection; resistant strains
Corn	Smut	Silver colored tumors	Ustilago zea	Rotate crops; avoid infected manure
Oats	Loose and covered smuts	Spikelets smut filled	Ustilago avenae Ustilago levis	Formaldehyde treatment
Oats	Crown rust	Red or black rust spots on the blades	Puccinia coronata	Early varieties; early seeding
Oats	Blade blight	Circular or streak lesions on the leaves, accompanied by a mottled red color	Pseudomonas avenae Bacillus avenae	None; resistant strains suggested
Potatoes	Late blight	After blossoming time leaves become brown beginning at the margins and spreading inwards. A downy growth may be seen on the underside of the leaf during moist weather.	Phytophthora infestans	Spray with Bordeaux Mixture as a preventive; destroy diseased tops before digging potatoes
Potatoes	Black leg	Plants light green, tops compact, stems inky black at surface of ground	Bacillus phytophthorus	Avoid infected seed if possible; treat seed with formaldehyde as for scab
Potatoes	Scab	Corky rough surface on tubers	Actinomyces chromogenus	Select sound seed stock; treat with formaldehyde

Diseases of Farm Crops (Continued)

Crop	Disease	Symptoms	Causative Organism	Control Measures
Potatoes	Early blight	Dark brown spots showing concentric rings on the leaves	Alternaria solani	Crop rotation, weekly spraying with 5-5-50 Bordeaux after plants are 6-8 inches tall
Potatoes	Black Scurf or Rosette	Black crust on tubers; girdling of stems by decay lesions; bushy tops; aerial potatoes	Rhizoctonia solani	Treat seed tubers with corrosive sublimate (4 oz. to 30 gal. water for 30 minutes)
Rye	Anthracnose	Whitening and blighting of heads just before ripening; small black dots may be observed at the point of attack	Colletotrichum cereale	Treat seed with formaldehyde
Rye, Wheat	Ergot	Dark horn like bodies replace grain	Claviceps purpurea	Remove ergot from seed rye by salt brine method; do not follow an ergoty rye crop with rye.
Wheat	Covered smut or bunt	All of kernel replaced by smut except epidermis	Tilletia foetans	Formaldehyde treatment—skimming method
Wheat	Loose smut	Spikelets entirely replaced by smut	Ustilago tritici	Modified hot water treatment of seed (132° F for ten minutes)
Wheat	Leaf smut	Smut streaks in the leaves	Urocystis tritici	Copper sulfate treatment; destruction of infected straw; rotation of crops
Wheat, Oats, Barley	Black stem rust	Red or black rust sori on stems, leaf sheaths, or leaves	Puccinia graminis	Eradicate common and purple leafed barberry; resistant varieties
Wheat	Scab	Pink mold on glumes and grain, later becoming black	Gibberella saubinetii	Clean seed, avoid following root rotted corn with wheat unless crop was entirely removed; hasten maturity in any manner possible

Corn Variety Recommendations—By Cropping Sections of Illinois

N. East Sect. I	N. West Sec. II	W. Central Sec. III	E. Central Sec. IV	S. W. Central Sec. V	Southern Sec. VI
Murdock's Yellow Dent	Murdock's Yellow Dent	Reid's Yellow Dent	Reid's Yellow Dent	Reid's Yellow Dent	Funk's 90 Day
Wis. No. 7	Wis. No. 7	Boone Co. White	Boone Co. White	Boone Co. White	Champion White Pearl
Hecker's Red.	Hecker's Red	Leaming Silvermine	Leaming	Leaming	Reid's Yellow Dent
		For Silage			
Western Plowman	Western Plowman	Champion White Pearl	Silvermine	Silvermine	Boone Co. White
Funk's 90 Day	Griffith's Early Dent	Silvermine Reid's Yellow Dent	Champion White Pearl	Champion White Pearl	Leaming (for River Bottoms)
Reid's Yellow Dent	Funk's 90 Day Reid's Yellow Dent		Reid's Yellow Dent	St. Charles White Funk's 90 Day	St. Charles White

The above suggestions regarding varieties are based not only upon the experimental evidence available, but also upon the performance of these varieties on a large number of farms and under conditions which might be considered typical of the area. The order in which these varieties are mentioned has no significance as to their relative yielding power.

Market Grades of Shelled Corn

White Corn—This class shall consist of corn of which at least 98 per cent by weight of the kernels are white. A slight tinge of light straw color or of pink on kernels of corn otherwise white shall not affect their classification as white corn.

Yellow Corn—This class shall consist of corn of which at least 95 per cent by weight of the kernels are yellow. A slight tinge of red on kernels of corn otherwise yellow shall not affect their classification as yellow corn.

Mixed Corn—This class shall consist of corn of various colors not coming within the limits for color as provided in the definitions of white corn and yellow corn. White-capped yellow kernels shall be classified as mixed corn.

Grade Requirements for White, Yellow, and Mixed Shelled Corn:

Grade No.	Minimum Test Weight per Bu.	Maximum Limits of Moisture	Foreign Material and Cracked Corn	Damaged Corn Total	Damaged Corn Heat Damage
	Lbs.	%	%	%	%
1	55	14.0	2	2	.0
2	53	15.5	3	4	0.1
3	51	17.5	4	6	0.3
4	49	19.5	5	8	0.5
5	47	21.5	6	10	1.0
6	44	23.0	7	15	3.0
Sample ...	..	....	..	..	...

U. S. D. A. Bureau of Markets.

Spring Wheat—Variety Yields

Variety	URBANA Years Tested	URBANA Aver. Bu. per A.	DEKALB Years Tested	DEKALB Aver. Bu. per A.
Blue Stem			5	21.7
Durum	5	22.7	4	28.2
Illinois No. 1.....	8	23.6	3	24.0
Kubanka			6	17.4
Marquis	5	23.2	5	31.6
Red Fife	5	18.9		
Saskatchewan Fife ..			6	22.1

Wheat Variety Recommendations—By Cropping Sections of Illinois

N. East Sect. I	N. West Sect. II	W. Central Sect. III	E. Central Sect. IV	S. W. Central Sect. V	Southern Sect. VI
Spring—	Spring—	Spring—	Spring—	Winter—	Winter—
Marquis	Marquis	Ill. No. I.	Ill. No. I	Turkey Red	Fulcaster
Ill. No. I	Ill. No. I	Marquis	Marquis	Turkey 10-110	Fultz
				Fulcaster	Economy
Winter—	Winter—	Winter—	Winter—		
Turkey Red	Turkey Red	Turkey Red	Turkey Red	Fultz	Illini Chief
Malakof	Malakof	Red Cross	Turkey 10-110	Red Cross	Rudy
Kharkof	Kharkof	Dawson's Golden Chaff	Red Cross	Illini Chief	Poole
		Malakof	Malakof	Dawson's Golden Chaff	
		Kharkof	Hungarian		
			Kharkof		

The above suggestions regarding varieties are based not only upon experimental evidence available, but also upon the performance of these varieties on a large number of farms, and under conditions which might be considered typical of the area. The order in which these varieties are mentioned has no significance as to their relative yielding power.

Market Grades of Wheat

WHEAT STANDARDS

Hard Red Winter Wheat (Class III)—This class shall include all varieties of hard red winter wheat, and may include not more than 10 per cent of other wheat or wheats. This class shall be divided into three subclasses as follows:

Subclass (a) Dark Hard Winter—This subclass shall include wheat of the class Hard Red Winter, consisting of 80 per cent or more of dark, hard, and vitreous kernels.

Subclass (b) Hard Winter—This subclass shall include wheat of the class Hard Red Winter, consisting of less than 80 per cent and more than 25 per cent of dark, hard, and vitreous kernels.

Subclass (c) Yellow Hard Winter—This subclass shall include wheat of the class Hard Red Winter, consisting of not more than 25 per cent of dark, hard, and vitreous kernels.

Class III—Hard Red Winter Wheat

Grade Requirements for:

(a) Dark Hard Winter, (b) Hard Winter, (c) Yellow Hard Winter

			Maximum limits of—					
			Damaged kernels		Foreign material other than dockage		Wheats of other classes	
Grade No.	Minimum test weight per bushel	Moisture	Total	Heat damage	Total [1]	Matter other than cereal grains	Total	Common White, White Club, and Durum, singly or combined
	Lbs.	%	%	%	%	%	%	%
1	60	13.5	2	0.1	1	0.5	5	2
2	58	14.0	4	0.2	2	1.0	10	5
3	56	14.5	7	0.5	3	2.0	10	10
4	54	15.5	10	1.0	5	3.0	10	10
5	51	15.5	15	3.0	7	5.0	10	10
Sample *	..	....	..	...	..	...	..	..

* Sample Grade shall be wheat of the subclass Dark Hard Winter, or Hard Winter, or Yellow Hard Winter, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive, or which has any commercially objectionable foreign odor except of smut, garlic, or wild onions, or is very sour, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality, or contains small, inseparable stones or cinders.

(1) The wheat in grade No. 1 shall be bright.

(2) The wheat in grades Nos. 1 to 4, inclusive, shall be cool and sweet.

(3) The wheat in grade No. 5 shall be cool, but may be musty or slightly sour. (U. S. D. A. Bureau of Markets.)

Market Grades of Wheat

WHEAT STANDARDS

Soft Red Winter Wheat (Class IV)—This class shall include all varieties of soft red winter wheat, also red club and red hybrid wheats of the Pacific Northwest, and may include not more than 10 per cent of other wheat or wheats. This class shall be divided into two subclasses as follows:

Subclass (a) Red Winter—This subclass shall include wheat of the class Soft Red Winter, consisting of both light and dark colored kernels. This subclass shall not include more than 10 per cent, either singly or in any combination, of Red Russian, red clubs, red hybrids, and other soft red winter wheats possessing the characteristics of those varieties as grown west of the Great Plains area of the United States.

Subclass (b) Red Walla—This subclass shall include wheat of the class Soft Red Winter, consisting of more than 10 per cent, either singly or in any combination, of Red Russian, red clubs, red hybrids, and other soft red winter wheats possessing the characteristics of those varieties as grown west of the Great Plains area of the United States.

Class IV—Soft Red Winter Wheat

Grade Requirements for:
(a) Red Winter, (b) Red Walla

Grade No.	Minimum test weight per bushel		Maximum limits of—						
				Damaged kernels		Foreign material other than dockage		Wheats of other classes	
	Red Winter	Red Walla	Moisture	Total	Heat damage	Total	Matter other than cereal grains	Total	Durum
	Lbs.	Lbs.	%	%	%	%	%	%	%
1	60	58	13.5	2	0.1	1	0.5	5	2
2	58	56	14.0	4	0.2	2	1.0	10	3
3	56	54	14.5	7	0.5	3	2.0	10	10
4	54	52	15.5	10	1.0	5	3.0	10	10
5	51	49	15.5	15	3.0	7	5.0	10	10
Sample*	..	..	....	..	...	..	...	..	..

* Sample Grade shall be wheat of the subclass Red Winter or Red Walla, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive, or which has any commercially objectionable foreign odor except of smut, garlic, or wild onions, or is very sour, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality, or contains small, inseparable stones or cinders.

(1) The wheat in grade No. 1 shall be bright.

(2) The wheat in grades Nos. 1 to 4, inclusive, shall be cool and sweet.

(3) The wheat in grade No. 5 shall be cool, but may be musty or slightly sour. (U. S. D. A. Bureau of Markets.)

Oats—Variety Yields

Variety	Maturity	Color of Kernel	(URBANA) Yrs. Tested	Bu. per Acre	% Rating	(DEKALB) Yrs. Tested	Bu. per Acre	% Rating
American Banner	Medium Late	White	16	49.1	98.9	9	63.5	103.6
Big Four	Medium Late	White	5	62.1	107.0	5	68.4	101.9
Black Gotham	Medium Late	Black	8	41.0	92.3			
Black Tartarian	Late	Black	9	39.7	84.1	4	59.8	87.7
Danish White	Medium Late	White	14	49.2	95.9	7	65.5	98.2
Early Champion	Early	White	7	50.0	95.9	4	66.7	97.8
Garton's No. 5	Medium Late	White	5	57.2	98.4	5	55.6	84.4
Great American	Medium Late	White	5	61.0	105.0	5	70.2	104.6
Hoitling	Medium Late	White				4	67.3	98.8
Irish Victor	Medium Late	White	14	51.6	100.6	7	65.1	97.7
Kherson	Early	Yellowish	7	54.8	105.1			
Lincoln	Medium Late	White	15	45.0	92.3	7	64.8	97.3
Mammoth Cluster	Medium Late	White	6	51.0	89.8	5	64.2	95.7
Minnesota	Medium Late	White	11	54.0	100.5	7	66.7	100.0
President	Early	White	5	58.7	101.0	5	65.4	97.6
Schoenen	Medium Late	White	12	52.2	101.1	9	64.9	105.9
Scottish Chief	Medium Late	White	4	55.4	97.1	5	67.5	100.6
Siberian	Medium Late	White	16	49.6	100.0	6	64.4	101.4
Silvermine	Medium Late	White	11	52.1	102.5	7	62.6	111.8
Silvermine (6-403)	Medium Late	White				6	69.1	108.3
Silver Plume	Medium Late	White	8	56.3	102.9	5	65.4	97.6
Sixty Day	Early	Yellow	14	58.0	110.7	7	61.7	100.6
Swedish Select	Medium Late	White	9	54.4	98.2	9	61.3	100.0
Texas Red	Medium Late	Reddish				5	64.5	96.2
Twentieth Century	Medium Late	White	11	40.0	87.4			
Victory	Medium Late	White	4	57.9	101.5	4	64.6	94.7
White Bonanza	Medium Late	White	15	51.6	104.3	6	66.8	99.2
White Kherson (Iowa 103)	Early	White	4	65.2	114.2	5	72.6	108.2
White Russian	Late	White	4	53.0	93.0	4	56.9	80.7
Wisconsin Pedigree No. 1	Medium Late	White	5	63.1	108.7	5	66.4	98.9
Yellow Kherson (Iowa 105)	Early	Yellow	5	64.0	110.2	4	68.0	107.1

NOTE: Were all varieties grown in comparison during the same period of years, they could readily be ranked according to their average yields. Since such is not the case, one variety which has been grown during the entire period is selected as the standard and the average yield of each of the other varieties tested, is compared with the average yield of the standard variety during the same years. The standard therefore always ranks 100 per cent and each of the other varieties ranks greater or less than 100 per cent as its average yield is greater or less than the standard. At Urbana, the standard is Siberian; at DeKalb, Swedish Select.

Market Grades of Oats

For the purposes of the official grain standards of the United States:

Oats—Oats shall be any grain which consists of cultivated oats and not more than 25 per cent of foreign material, other grains, and wild oats, either singly or in any combination.

Color Classification—All oats shall be designated as white, red, gray, black or mixed, according to the color of the oats, as the case may be. For the purposes of this classification, white oats include yellow oats. Oats shall be white, red, gray, or black, respectively, when they consist of oats of such color, and not more than 10 per cent of other colors of cultivated and wild oats, either singly or in any combination. Mixed oats shall be all other oats.

Grades—All oats shall be graded and designated as No. 1, No. 2, No. 3, No. 4, or Sample Grade, white, red, gray, black, or mixed, as the case may be, according to the respective requirements thereof as specified in these standards, except that in the case of mixed oats the requirements as to the maximum percentages of other colors shall be disregarded.

Clipped Oats—Clipped oats shall be oats which have the general appearance of having had the ends removed by an oat clipper. Clipped oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not clipped, and there shall be added to, and made a part of, such grade designation the word "Clipped."

Bleached Oats—Bleached oats shall be oats which in whole or in part have been treated by the use of sulphurous acid or other bleaching chemicals. Bleached oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not bleached, and there shall be added to, and made a part of, such grade designation the word "Bleached."

Grade Requirements for White, Red, Gray, Black, Mixed, Bleached, and Clipped Oats

Grade	Condition and general appearance[1]	Minimum test weight per bushel	Sound cultivated oats not less than	Heat damaged (oats or other grains)	Foreign material	Wild oats	Other colors, cultivated and wild oats
				Not to exceed—			
		Lbs.	%	%	%	%	%
1[2]	Shall be cool and sweet, and of good color.....	32	98	0.1	2	2	2[3]
2	Shall be cool and sweet and may be slightly stained	29	95	0.3	2	3	5[4]
3	Shall be cool and sweet, and may be stained or slightly weathered	26	90	1.0	3	5	10
4	Shall be cool, and may be musty, weathered or badly stained ..	23	80	6.0	5	10	10
Sample Grade	Shall be white, red, gray, black, mixed, bleached, or clipped oats, respectively, which do not come within the requirements of any of the grades from No. 1 to No. 4, inclusive, or which have any commercially objectionable foreign odor, or are heating, hot, sour, infested with live weevils or other insects injurious to stored grain, or are otherwise of distinctly low quality.						

[1] The percentage of moisture in grades Nos. 1, 2 and 3 shall not exceed 14½, and in grade No. 4 shall not exceed 16.
[2] In the case of white oats, No. 1 shall be cool and sweet and of good white or creamy white color.
[3] 4 per cent of other colors allowed in No. 1 red, gray, or black oats. This column does not apply to mixed oats.
[4] 10 per cent of other colors allowed in No. 2 red, gray, or black oats. (U. S. D. A. Bureau of Markets.)

Treating Oats for Smut

In treating oats for smut the Illinois Experiment Station recommends

1 Pint of Formalin
to
10 Gallons of Water
to
80 bushels of Oats.

This requires the use of one pint of the solution for each bushel of oats treated.

Meadow Mixtures for

Well Drained Medium Fertile to Rich Soils

No. 1

Sweet Clover	4 lbs.
Red Clover	3 lbs.
Alsike Clover	2 lbs.
Timothy	2 lbs.

No. 2

Sweet Clover	4 lbs.
Red Clover	1½ lbs.
Mammoth Clover	1½ lbs.
Alsike Clover	2 lbs.
Timothy	2 lbs.

No. 3

Sweet Clover	5 lbs.
Alsike Clover	3 lbs.
Timothy	2 lbs.

No. 4

Red Clover	3 lbs.
Alsike Clover	2 lbs.
Alfalfa	2 lbs.
Timothy	3 lbs.

No. 5

Sweet Clover	4 lbs.
Alfalfa	4 lbs.
Alsike	4 lbs.
Timothy	4 lbs.

No. 6

Sweet Clover	2 lbs.
Alfalfa	3 lbs.
Alsike	3 lbs.
Timothy	4 lbs.

No. 7

Sweet Clover	4 lbs.
Red Clover	3 lbs.
Alsike	1 lb.
Timothy	2 lbs.

No. 8

Alfalfa	4 lbs.
Alsike	3 lbs.
Red Clover	4 lbs.

Mixtures 1, 2 and 3 have been used on the Meharry Farms at Tolono, for both meadow and pasture: No. 4 is recommended by Frank I. Mann of Gilman, and No. 5 is the Demaree mixture extensively used in Grundy County.

Flat, Poorly Drained Soils

Red Top	10 lbs.
Blue Grass	8 lbs.
Timothy	4 lbs.
Alsike	2 lbs.

Dry, Sandy, Poor Soils

Orchard Grass	8 lbs.
Brome Grass	6 lbs.
Sweet Clover	3 lbs.
Red Clover	3 lbs.

Pasture Mixtures

All of the above meadow mixtures may be used for pasture mixtures as well. Those having sweet clover give greater total pasturage and are therefore to be preferred. Where a third year of pasture is expected from a given mixture the proportions of Alsike clover and timothy should be increased.

In addition to the mixtures previously mentioned the following work well as pastures:

Fertile Well Drained Soils

Sweet Clover	4 lbs.
Alsike Clover	4 lbs.
Timothy	2 lbs.

Sweet Clover	4 lbs.
Alsike Clover	2 lbs.
Timothy	2 lbs.

Flat, Poorly Drained Soils

Redtop	12 lbs.
Bluegrass	4 lbs.
Timothy	4 lbs.
Alsike Clover	2 lbs.

Wet Bottom Lands

Meadow Fescue	10 lbs.
Meadow Foxtail	6 lbs.
Redtop	4 lbs.
Alsike Clover	4 lbs.

Number Hills or Plants Per Acre

Distance	6 in.	8 in.	12 in.	15 in.	18 in.	21 in.	24 in.	30 in.	36 in.	42 in.	48 in.	60 in.	72 in.
6 inches ..	174,239												
8 inches ..	130,679	98,010											
12 inches ..	87,120	65,340	43,560										
15 inches ..	69,692	52,272	34,848	27,878									
18 inches ..	58,080	43,560	29,040	23,231	19,360								
21 inches ..	49,782	37,336	24,891	19,913	16,594	14,223							
24 inches ..	43,560	32,670	21,780	17,424	14,520	12,446	10,890						
30 inches ..	34,848	26,136	17,424	13,939	11,616	9,956	8,712	6,969					
36 inches ..	29,040	21,780	14,520	11,615	9,680	8,297	7,260	5,808	4,840				
42 inches ..	24,891	18,668	12,445	9,956	8,297	7,112	6,223	4,979	4,149	3,556			
48 inches ..	21,780	16,335	10,890	8,712	7,260	6,223	5,445	4,356	3,630	3,111	2,722		
60 inches ..	17,424	13,068	8,712	6,970	5,808	4,977	4,356	3,485	2,904	2,490	2,178	1,742	
72 inches ..	14,520	10,890	7,260	5,808	4,840	4,148	3,630	2,904	2,420	2,074	1,815	1,451	1,210

Square acre is 208.71 ft. on each side.

Finding Number Bushels in a Bin

Rectangular Bin—Multiply the length by the breadth by the depth in feet and multiply this product by 0.8, the number of bushels in a cubic foot. The result is expressed in the number of bushels.

Circular Bin—(a) Multiply the square of the diameter in feet by the depth in feet and this product by 5/8. The result is the number of bushels in the bin.

(b) Square the radius, multiply by 3.1416 and multiply this product by the height of the bin. This will give the number of cubic feet in the bin and this figure by 0.8 will give the number of bushels.

Measuring Corn in a Crib

On account of the variation in moisture content of the corn at the various stages of drying it is impossible to determine accurately the number of bushels a given crib contains. The following figures are as nearly accurate as possible to approximate.

Multiply the length by the width by the height all in feet and divide this product by 5 for old corn and by 4 for new corn. The final product will approximate the number of bushels.

Measuring Hay in a Mow

Multiply the length, by the height, by the width in yards and divide by 15, if the hay is well packed. If the hay is shallow or is rather loose in the mow divide by 18. These figures should be varied from 15 to 18 depending upon the character of packing. The quotient will be the approximate number of tons.

Measuring Hay in the Stack

The Bureau of Plant Industry in Circular No. 131, on the measuring of hay in stacks, handles this problem in the most scientific way possible. The investigators in studying this problem found that the formulae must vary according to the shape of the stack. Their standard formula is: The cubic feet in a stack equals the overthrow, multiplied by the width, multiplied by the length, multiplied by a fraction which varies from

.25 to .37. If the stack is low and pointed, the figure would be .25, whereas, if it is quite high and more nearly flat on top, it should be .37. In the circular referred to, diagrams are given of the different shapes and the proper figures to go with each. We suggest that anyone interested in measuring hay at any time send to the Bureau of Plant Industry, Washington, D. C., for Circular No. 131.

The number of cubic feet in a ton of hay varies from 350 to over 600. Well packed clover hay runs about 500 cubic feet to the ton, while well packed wild hay might not run over 350 or 400 cubic feet to the ton.

Implements Used in Cultivating Corn

During the last eight years the Illinois Agricultural Experiment Station has conducted an experiment to test the relative merits of four of the common types of cultivator; viz., the small eight-shovel cultivator, the Tower cultivator, the disk cultivator and the large four-shovel cultivator.

The first three implements are adapted to shallow level cultivation and were used in that way. The large shovel cultivator runs rather deeper and tends to leave the surface ridged. The disk cultivator is adjusted to throw the soil to the corn each time. A drag attachment is fitted to the cultivator which draws the soil back from the corn, thus preventing any considerable ridging of the surface.

The average yields obtained by the use of the three surface cultivators were practically equal. As an average of the yields for the eight years, cultivation with the large shovel cultivator resulted in a yield of 1.8 bushels per acre less than the average yield obtained by the use of the surface cultivators.

General Hints on Feeding

(1) To work horses feed 1 to 1⅓ pounds of concentrates per day per 100 pounds of live weight, and about the same or a slightly less amount of hay, the amount depending upon the hardness of the work.

(2) To fattening cattle on full feed, feed 1¾ to 2 pounds of concentrates and ¾ of a pound of roughage per day per 100 pounds live weight.

(3) To hogs weighing about 100 pounds, feed 4 to 5 pounds of concentrates per 100 pounds of live weight per day; or if on pasture, feed 3 to 4 pounds of concentrates.

(4) To fattening hogs weighing 200 to 250 pounds, feed 3 pounds of concentrates per 100 pounds daily.

(5) To fattening lambs on full feed weighing about 50 pounds, feed 1 pound of concentrates and 1½ pounds of roughage daily.

(6) To Holsteins and Ayrshires feed about 2 pounds of grain for each gallon of milk produced.

To Guernseys and Jerseys feed about 2½ pounds of grain for each gallon of milk produced.

Feeds	1 quart weighs Lbs.
Barley (whole)	1.5
Barley (ground)	1.1
Brewers' grains	0.6
Corn (shelled)	1.7
Corn (ground)	1.5
Cottonseed meal	1.5
Gluten feed	1.3
Linseed meal	1.1
Oats (whole)	1.0
Oats (ground)	0.7
Wheat bran	0.5
Wheat middlings	1.2
Wheat shorts	0.8

Average Composition of and Digestible Nutrients in Feedingstuffs

Feedingstuff	Water	Ash	Crude Protein	Carbohydrates: Crude Fiber	Carbohydrates: N-free Extract	Fat	Digestible Crude Protein	Digestible Carbohydrates	Digestible Fat
GRAINS AND SEEDS									
Cereals	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Dent corn	10.6	1.5	10.3	2.2	70.4	5.0	7.6	67.5	4.6
Soft corn	31.1	0.9	7.4	1.3	55.7	3.6	5.5	53.1	3.3
Corn meal	11.8	1.4	9.8	2.4	70.5	4.1	7.3	67.7	3.8
Corn and cob meal	11.0	1.4	8.9	6.7	68.4	3.6	4.6	63.2	3.0
Wheat	10.5	1.8	11.9	1.8	71.9	2.1	8.8	68.0	1.5
Rye	11.6	1.9	10.6	1.7	72.5	1.7	8.9	68.3	1.1
Oats	11.0	3.0	11.8	9.5	59.7	5.0	9.2	51.7	4.3
Barley	12.0	2.5	11.4	5.7	66.6	1.8	8.9	64.5	1.4
Kafir grain	12.3	1.9	12.3	2.2	68.2	3.1	10.0	63.9	2.4
Sorghum grain	12.8	2.1	9.1	2.6	69.8	3.6	7.4	65.6	2.7
Legumes									
Cowpea	11.9	3.4	23.5	3.8	55.7	1.7	19.3	54.2	1.3
Soybean	8.7	5.4	36.3	3.9	27.7	18.0	30.5	23.4	14.8
Velvet bean	11.7	2.6	20.8	7.5	51.0	6.4	17.5	43.3	5.2
CEREAL BY-PRODUCTS									
Hominy feed	10.0	2.8	10.8	4.9	64.6	6.9	7.1	61.8	6.3
Gluten feed	8.5	1.9	25.9	7.2	53.3	3.2	22.0	52.4	2.7
Germ oilmeal	9.0	2.7	22.7	9.3	45.9	10.4	16.6	43.0	10.0
Red dog flour	9.7	3.5	19.5	2.8	59.3	5.2	17.2	53.2	4.5
Flour wheat middlings	10.0	3.2	18.8	3.3	59.9	4.8	16.5	53.9	4.1
Shorts	10.0	4.3	17.8	7.0	55.9	5.0	13.7	45.7	4.4
Wheat bran	10.0	6.2	16.1	10.0	53.3	4.4	12.6	41.5	3.0
Rye middlings	11.0	3.3	14.8	3.8	64.4	2.7	11.8	60.0	2.4
Oat hulls	7.3	6.7	3.3	29.7	52.1	1.0	1.7	45.4	0.8
OIL BY-PRODUCTS									
Cottonseed meal, choice	7.0	6.7	44.6	6.5	25.2	10.0	37.5	21.3	9.5
Cottonseed meal, prime	7.1	5.8	40.0	10.4	29.3	7.4	33.6	25.8	7.0

Average Composition of and Digestible Nutrients in Feedingstuffs (Continued)

Feedingstuff	Water	Ash	Crude Protein	Carbohydrates: Crude Fiber	Carbohydrates: N-free Extract	Fat	Digestible Crude Protein	Digestible Carbohydrates	Digestible Fat
OIL BY-PRODUCTS (Cont.)	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Cottonseed meal, good	7.2	5.8	37.7	11.8	30.1	7.5	31.7	27.0	7.1
Cold pressed cottonseed	8.4	4.0	26.6	25.8	28.4	7.9	21.5	32.8	7.6
Cottonseed feed	8.8	4.1	23.1	22.6	36.5	4.9	13.4	32.5	4.4
Cottonseed hulls	11.1	2.8	4.2	46.3	33.4	2.2	0.3	33.2	1.7
Linseed meal, O. P.	8.5	5.2	34.3	8.5	36.4	7.1	30.5	33.2	6.3
Linseed meal, N. P.	9.0	5.6	37.4	8.9	36.4	2.7	32.2	38.2	2.6
Peanut cake	10.7	4.9	47.6	5.1	23.7	8.0	42.8	20.4	7.2
Cocoanut meal	10.5	5.2	21.4	11.7	42.7	8.5	16.7	41.4	8.2
PACKING HOUSE BY-PRODUCTS									
Dried blood	8.5	4.7	84.4			2.5	70.9		2.4
Fish meal	10.8	29.2	48.4			11.6	37.8		11.6
Tankage, good grade	7.0	15.0	61.0	3.5	3.5	10.0	56.7		9.8
MISCELLANEOUS CONCENTRATES									
Beet pulp, dry	10.0	3.3	9.1	18.6	58.3	0.7	4.7	63.8	0.5
Molasses, cane	26.0	6.2	3.2		64.6		1.0	58.1	
Cow's milk, whole	87.2	0.7	3.6		4.9	3.7	3.6	4.9	3.7
Cow's milk, skim	90.5	0.8	3.6		5.1	0.1	3.6	5.1	0.1
Buttermilk	90.4	0.8	3.6		5.0	0.2	3.6	5.0	0.2
Whey	93.8	0.4	0.6		5.1	0.1	0.6	5.1	0.1
HAYS									
Alfalfa	9.1	8.4	14.7	28.4	35.8	1.9	10.4	38.0	0.7
Clover, alsike	15.0	9.7	14.0	23.1	36.1	2.1	9.2	35.4	0.8
Clover, mammoth	15.0	8.2	13.1	24.4	37.6	1.7	7.7	38.0	1.0
Clover, red	15.0	7.7	13.3	24.3	37.2	2.5	7.7	37.3	1.4
Clover, sweet	9.0	7.3	14.4	27.3	39.9	2.1	10.8	38.0	0.7
Cowpea	10.7	8.5	18.6	20.1	39.2	2.9	12.6	36.1	1.1
Soybean	11.3	7.2	15.4	22.3	38.6	5.2	10.9	40.2	1.5

Average Composition of and Digestible Nutrients in Feedingstuffs (Continued)

Feedingstuff	Water	Ash	Crude Protein	Carbohydrates: Crude Fiber	Carbohydrates: N-free Extract	Fat	Digestible Crude Protein	Digestible Carbohydrates	Digestible Fat
HAYS (Cont.)	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Millet	10.2	7.9	7.7	27.7	49.0	2.3	4.6	51.6	1.4
Prairie hay	13.3	13.8	5.5	26.4	43.4	2.5	3.3	38.3	1.0
Red top	8.9	5.2	7.9	28.6	47.5	1.9	4.9	47.3	1.0
Timothy, all analyses	13.2	4.4	5.9	29.0	45.0	2.5	2.8	42.4	1.2
FODDERS AND STOVERS									
Corn fodder	18.3	4.0	6.7	17.0	52.1	1.8	3.0	48.7	1.3
Corn stover	17.0	6.3	5.6	28.0	42.1	1.0	2.1	43.3	0.6
STRAWS									
Barley straw	14.2	5.7	3.5	36.0	39.1	1.5	0.7	41.3	0.6
Oat straw	9.2	5.1	4.0	37.0	42.4	2.3	1.2	38.7	0.8
Rye straw	7.1	3.2	3.0	38.9	46.6	1.2	0.6	40.5	0.4
Wheat straw	9.6	4.2	3.4	38.1	43.4	1.3	0.4	36.3	0.4
Soybean straw	10.1	5.8	4.6	40.4	37.4	1.7	2.3	40.1	1.0
Clover straw	16.0	5.7	9.1	44.6	22.8	1.8	4.5	31.9	1.1
PASTURE, OR FORAGE AND SOILING CROPS									
Legumes									
Alfalfa	71.8	2.7	4.8	7.4	12.3	1.0	3.6	12.1	0.4
Clover, alsike	74.8	2.0	3.9	7.4	11.0	0.9	2.6	12.5	0.6
Clover, mammoth	80.0	1.9	3.0	5.8	8.9	0.4	2.0	9.9	0.3
Clover, red	70.8	2.1	4.4	8.1	13.5	1.1	2.9	14.8	0.7
Clover, sweet	80.0	1.9	3.8	6.3	7.4	0.6	2.5	9.1	0.4
Clover, white	81.5	2.1	4.4	4.3	6.9	0.8	2.9	9.7	0.5
Cowpea	85.0	2.0	2.8	3.5	6.3	0.4	2.1	7.2	0.2
Grasses									
Bluegrass, Kentucky	65.1	2.8	4.1	9.1	17.6	1.3	2.9	19.7	0.8
Millet	71.1	1.7	3.1	9.2	14.2	0.7	2.0	15.9	0.4
Orchard grass	70.0	2.1	2.9	10.4	13.7	0.9	1.7	13.7	0.5

Average Composition of and Digestible Nutrients in Feedingstuffs (Continued)

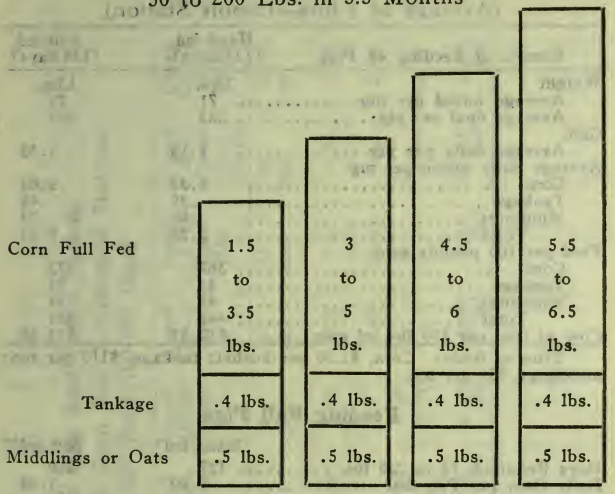
Feedingstuff	Water	Ash	Crude Protein	Carbohydrates Crude Fiber	Carbohydrates N-free Extract	Fat	Digestible Crude Protein	Digestible Carbohydrates	Digestible Fat
GRASSES (Cont.)	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Red top	65.3	2.3	2.8	11.0	17.7	0.9	2.0	21.3	0.6
Timothy	61.6	2.1	3.1	11.8	20.2	1.2	1.6	19.0	0.6
Rye	76.6	1.8	2.6	9.6	8.8	0.6	2.1	14.1	0.4
SILAGE									
Corn, well matured	73.7	1.6	2.2	6.5	15.0	0.9	1.1	14.9	0.7
Corn, immature	80.0	1.1	1.7	5.4	11.1	0.7	0.9	11.2	0.5
Corn, ears removed	80.4	1.4	1.4	6.3	9.8	0.7	0.7	11.1	0.6
Sunflower	79.6	1.6	2.1	6.8	10.4	0.5	1.2	10.1	0.4
ROOTS									
Beet, sugar	86.7	0.8	1.5	0.9	9.9	0.1	1.1	9.9	0.1
Carrot	88.6	1.0	1.1	1.3	7.6	0.4	1.0	8.7	0.4
Mangel	91.2	1.0	1.4	0.8	5.4	0.2	0.7	5.3	0.1
Potato	78.9	1.0	2.1	0.6	17.3	0.1	1.3	15.6	
Rutabaga	88.6	1.2	1.2	1.3	7.5	0.2	1.0	8.1	0.2
MISCELLANEOUS ROUGHAGES									
Apple pomace	76.7	0.5	1.4	3.9	16.2	1.3	0.3	14.4	0.6
Pumpkin	90.9	0.5	1.3	1.7	5.2	0.4	1.0	5.6	0.4
Rape	84.5	2.0	2.3	2.6	8.4	0.5	2.0	9.6	0.2

Forage Crops for Hogs

Crop	Seed per Acre	Time to Plant	Method of Planting	Ready for Forage	Length of Grazing Period
Alfalfa	12 to 15 lbs.	Apr. 1-15 Aug. 1-15	Drill or broadcast	4-6 mos.	5-6 mos.
Red Clover	10 to 12 lbs.	Mch. & Apr.	Drill or broadcast	3-4 mos.	4-5 mos.
Sweet Clover	10 to 15 lbs.	April	Drill or broadcast	2-3 mos.	4-5 mos.
Oats	1 to 2 bu.	March	Drill or broadcast	6-8 weeks	4-6 weeks
Oats Sweet Clover	1 bu. 8 to 10 lbs.	Mch. 15 to Apr. 15	Broadcast	8 to 10 wks.	4 to 5 mos.
Oats and Rape	1 bu. 3 to 4 lbs.	March and April	Broadcast	6-8 weeks	5-8 weeks
Rape	6 to 7 lbs.	Apr. 1 to July 1	Drill or broadcast	8-10 weeks	2-4 mos.
Rye	1 to 1½ bu.	Aug. 15 to Sept. 20	Drill or broadcast	6-8 weeks	10-12 weeks
Soybeans	30 lbs.	May 1 to June 1	Drill in 28-in. rows	3-4 mos.	4-5 weeks
Soybeans	60-75 lbs.	May 15 to June 1	Drilled	3-4 mos.	5-6 weeks
Corn and Soybeans	7-10 lbs. 4-6 lbs.	May 1 to June 15	In rows together	12-14 weeks	3-6 weeks

Daily Rations for a Pig at Different Weights

50 to 200 Lbs. in 5.5 Months



Average daily gain 1.2 lbs.

Feed per 100 lbs. gain 425 lbs.

Amount of Grain for Pigs on Pasture

Initial Weight, 45 Lbs. Final Weight, 225 Lbs.
Full Fed in Dry Lot After Oct. 15

How Fed on Pasture	Reached Weight of 225 lbs. on	Daily Gain per Pig	Feed per 100 lbs. Gain		Cost of Feed per 100 lbs. Gain
			Corn	Tankage	
Self-fed Corn and Tankage	Nov. 15	1.23	368	36	$11.84
2/3 Grain Ration*	Dec. 17	.97	406	12	11.54
1/3 Grain Ration	Jan. 28	.78	467	24	13.84
No Grain Ration	Grain fed at the end of 8 weeks to keep part of them from starving.				

Corn $1.50 per bu. Tankage $110 per ton.

* 2/3 ration is 2 lbs. of grain for each 100 lbs. live weight of animals.

Hand vs. Self-Feeding Corn, Tankage, and Middlings in the Dry Lot

(Average of 4 lots—Illinois Station)

Results of Feeding 48 Pigs	Hand-fed (137 days)	Self-fed (138 days)
Weight	Lbs.	Lbs.
Average initial per pig	71	71
Average final per pig	232	245
Gain		
Average daily per pig	1.18	1.35
Average daily ration per pig		
Corn	4.33	5.02
Tankage	.39	.48
Middlings	.56	.73
Total	5.28	6.23
Feed per 100 pounds gain		
Corn	367	372
Tankage	33	35
Middlings	48	54
Total	448	461
Cost of feed per 100 lbs. of gain	$12.97	$13.38

Price of feeds: Corn, $1.50 per bushel; tankage, $110 per ton; middlings, $55 per ton.

Feeding Fall Pigs

	Hand fed*	Self-fed**
Days Required, 73 to 225 lbs.	127	110
Daily Gain per Pig, lbs.	1.20	1.38
Feed Eaten per 100 lbs. Gain, lbs.	481	471
Cost of Feed per 100 lbs. Gain	$13.60	$13.70

Corn, $1.50 per bu. Tankage, $110 per ton. Middlings, $55 per ton.

* Hand fed: Corn, 14 parts; tankage, 1 part; middlings, 2 parts.

** Self fed: Corn, 9 parts; tankage, 1 part; middlings, 1.5 parts.

Oats vs. Middlings for Feeding Fall Pigs

40 Pigs per Lot

Self-fed Free Choice	Corn Tankage Whole Oats	Corn Tankage Middlings
Days Required from 56 to 225 lbs.	132	134
Average Daily Gain per Pig	1.25	1.26
Feed per 100 lbs. Gain — C	346	348
Feed per 100 lbs. Gain — T	46	46
Feed per 100 lbs. Gain — O	58	64
Total	450	458
Cost of Feed per 100 lbs. Gain	$12.98	$13.68

Corn, $1.50 per bu. Oats. 65c per bu. Tankage, $110 per ton. Middlings, $55 per ton.

Oats May Be Fed Profitably

When valued at one-half as much per bushel as corn.

By replacing wheat middlings as the additional feed to corn and tankage.

By making up part of the grain ration for growing pigs and brood sows.

Comparison of Important Corn Belt Beef Cattle Rations

Average Results Obtained at Several Corn Belt Experiment Stations

Two Year Old Steers on Full Feed 100-180 Days

Rations Fed	Corn† Alfalfa	Corn† C. S. M. Alfalfa	Corn† C. S. M. Alfalfa Silage	Corn† Alfalfa Stover	Corn† Alfalfa Silage	Corn† Clover Hay	Corn† C. S. M. Clover Hay	Corn† C. S. M. Clover Hay Silage	Corn† Clover Hay Silage	Corn† C. S. M. Silage
Number of lots averaged.....	7	5	6	5	8	6	11	19	4	10
Number of cattle involved.....	62	49	60	40	72	68	125	205	40	107
Feed per pound gain										
Corn (shelled basis)	6.56	6.57	5.45	7.96	6.07	9.07	7.25	5.95	7.94	5.91
C. S. M.		1.09	1.12				1.21	1.13		1.10
Clover Hay						4.57	4.61	1.61	2.06	
Alfalfa Hay	5.41	5.19	1.22	2.53	2.24					
Corn Silage			11.70		8.50			9.65	12.45	12.57
Corn Stover				1.92						
Average Daily Gain	2.36	2.41	2.27	2.32	2.20	2.08	2.40	2.43	1.88	2.29
*	.08*	.10*	.09*	.07*	.05*	.06*	.05*	.04*	.04*	.06*

†Shelled basis.

*Plus or minus; indicates the limits of probable error.

NOTE: C. S. M.=Cottonseed Meal.

Fattening Steers of Various Market Grades

Feeding Period Nov. 29, 1902-May 29, 1903—179 Days

Grade of Feeders	No. of steers	Initial wt. per steer	Final wt. per steer	Aver. daily gain	Lbs. of beef per bu. of corn	Grades of steers when finished
Fancy	16	934	1394	2.570	9.74	15 prime 1 choice
Choice	16	1114	1570	2.543	7.97	14 prime 1 choice 1 good
Good	16	1019	1438	2.341	7.99	3 prime 5 choice 8 good
Medium	16	1022	1403	2.128	7.45	1 choice 4 good 8 medium
Common	16	966	1361	2.207	8.13	5 good 6 medium 5 common
Inferior	16	965	1315	1.957	7.61	4 good 6 medium 6 common

All lots were fed the same rations and under same conditions. Illinois Bulletin No. 90.

Feeding Two Year Old Steers Limited Corn Rations

100-140 days

Results Based Upon Averages from Various Experiment Stations

	No Corn	Corn last half (approx.) of period	Light Corn Ration entire period Less than 10 Pounds
Number of Lots Averaged	5	8	4
Number of Cattle Involved	52	90	39
Feed per Pound Gain			
Corn (shelled basis)	None	2.72	3.80
Nitrogenous Concentrates	1.53	1.38	1.38
Dry Roughage (mostly alfalfa or clover)	1.80	2.56	1.98
Corn Silage	28.60	16.93	18.65
Average Daily Gain	1.91—*.08	2.00—*.05	1.96—*.09

*Plus or minus; indicates the limits of probable error.

*Manure Produced by Livestock

(Exclusive of Bedding)

Per 1000 Pounds Live Weight

Animal	Pounds per day	Tons per yr.	Composition Pounds per Ton: Dry Matter	Nitrogen	Phosphorus	Potassium
Horse	49	8.9	440	14	2.2	9.1
Cow	74	13.5	280	12	1.3	7.5
†Steer (full feed)	49		264	10	3.3	
Swine	83	15.1	260	10	3.0	6.6
Sheep	34	6.2	640	19	3.0	16.6
Hen	23	4.2	900	15	8.0	5.0

*Van Slyke—Fertilizers and Crops.
†Illinois Exp. Sta. Bulletin 209.

Poultry Feeding

Feeding the Chicks—Chicks should not receive feed until they are 36 hours old. The third and fourth days they may be fed a mixture of equal parts of hard-boiled eggs and rolled oats or stale bread, or stale bread soaked in milk. When bread and milk are used, care should be taken to squeeze all the milk out of the bread. From the fourth day chick feed may be fed until the chicks are old enough to eat wheat screenings or cracked corn.

To insure rapid and uniform growth, provide in addition to a grain feed, a dry mash to which the chickens will have access at all times.

Feeding for Egg Production—Grain mixtures for the laying stock, the proportions being by weight.

Ration 1	Ration 2	Ration 3
Equal parts of	3 parts cracked corn	2 parts cracked corn
Cracked Corn	2 parts oats	1 part oats
Wheat	1 part wheat	
Oats		

The mixture should be scattered in the litter morning and evening. Dry mash mixtures should be available in a self-feeder at all times.

Mixture 1	Mixture 2	Mixture 3
2 parts corn meal	1 part corn meal	3 parts corn meal
1 part bran	1 part middlings	1 part beef scrap or
1 part middlings	1 part tankage	tankage
1 part tankage		

Sprouted oats, cabbage, or mangels will increase the egg yield in winter.

Charcoal, grit and oyster shell should be available at all times.

Preserving Eggs

I. Water Glass Method

For 15 dozen eggs, use one quart of sodium silicate to 10 quarts of water that has been boiled and cooled. Place the mixture in a five gallon jar or crock which has been thoroughly cleaned and scalded. Use only clean, fresh eggs. At least two inches of the solution should cover the eggs at all times. Place the jar in a cool, dry place and cover it with waxed paper tied around the top to prevent evaporation.

II. Lime Method

Dissolve 2 or 3 pounds of unslaked lime in five gallons of water that has been boiled and cooled. Allow the mixture to stand until the lime settles and liquid is clear. Place clean, fresh eggs in a clean earthen-ware jar and pour in the clear limewater until eggs are covered at least two inches. Cover and store as above.

Monthly Average Hog Prices at Chicago

1904-1920—17 Years

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1904	$ 4.90	$ 5.15	$ 5.35	$ 5.10	$ 4.65	$ 5.05	$ 5.40	$ 5.30	$ 5.75	$ 5.40	$ 4.80	$ 4.50	$ 5.15
1905	4.65	4.85	5.15	5.45	5.40	5.35	5.65	5.95	5.50	5.25	4.85	4.90	5.25
1906	5.40	6.00	6.30	6.55	6.45	6.55	6.65	6.25	6.25	6.40	6.20	6.25	6.25
1907	6.60	7.05	6.65	6.65	6.40	6.10	6.05	6.00	6.00	6.15	4.90	4.70	6.10
1908	4.40	4.45	6.00	5.85	5.50	5.80	6.50	6.55	6.85	5.95	5.80	5.65	5.70
1909	6.10	6.35	6.70	7.20	7.30	7.65	7.85	7.75	8.20	7.75	8.00	8.35	7.35
1910	8.55	9.05	10.55	9.90	9.55	9.45	8.75	8.35	8.90	8.50	7.60	7.65	8.90
1911	7.95	7.40	6.85	6.25	6.00	6.25	6.70	7.30	6.90	6.45	6.30	6.40	6.70
1912	6.25	6.20	7.10	7.80	7.65	7.50	7.65	8.25	8.45	8.75	7.75	7.40	7.55
1913	7.45	8.15	8.90	9.05	8.55	8.65	9.05	8.35	8.30	8.20	7.75	7.70	8.35
1914	8.30	8.60	8.70	8.65	8.45	8.20	8.70	9.00	8.85	7.65	7.50	7.10	8.30
1915	6.90	6.80	6.75	7.30	7.60	7.60	7.75	6.90	7.25	7.90	6.65	6.40	7.10
1916	7.20	8.20	9.65	9.75	9.85	9.70	9.80	10.30	10.70	9.80	9.60	9.95	9.60
1917	10.90	12.45	14.80	15.75	15.90	15.50	15.20	16.90	18.20	17.15	17.40	16.85	15.10
1918	16.30	16.65	17.10	17.45	17.45	16.60	17.75	19.00	19.65	17.70	17.70	17.55	17.45
1919	17.60	17.65	19.10	20.40	20.60	20.40	21.85	20.00	17.45	14.35	14.20	13.60	17.85
1920	15.00	14.55	14.95	14.90	14.30	14.70	14.85	14.75	15.90	14.05	12.20	9.55	14.15
Average	$ 8.50	$ 8.80	$ 9.45	$ 9.65	$ 9.51	$ 9.47	$ 9.77	$ 9.82	$ 9.95	$ 9.26	$ 8.78	$ 8.50	$ 9.23

Monthly Average Native Beef Cattle Prices at Chicago

1904-1920—17 Years

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1904	$ 4.65	$ 4.50	$ 4.60	$ 4.65	$ 4.85	$ 5.60	$ 5.40	$ 5.10	$ 5.10	$ 5.20	$ 4.95	$ 4.40	$ 4.95
1905	4.65	4.75	5.00	5.75	5.45	5.25	4.95	5.00	5.05	4.80	4.65	4.75	5.05
1906	5.00	5.05	5.15	5.05	5.20	5.20	5.40	5.45	5.50	5.60	5.60	5.50	5.30
1907	5.60	5.55	5.55	5.65	5.65	6.20	6.40	6.25	6.10	6.10	5.40	5.10	5.80
1908	5.30	5.40	6.00	6.50	6.60	6.90	6.45	6.00	5.95	5.70	5.90	6.00	6.10
1909	6.00	5.85	6.10	6.10	6.45	6.45	6.45	6.70	6.75	6.60	6.45	6.20	6.35
1910	6.20	6.35	7.35	7.55	7.50	7.50	7.10	6.85	6.80	6.60	6.20	6.00	6.80
1911	6.15	6.15	6.20	6.10	5.95	6.05	6.30	6.95	6.80	6.75	6.70	6.65	6.40
1912	6.85	6.60	7.20	7.65	7.95	8.00	7.90	8.50	9.15	7.90	8.10	7.85	7.75
1913	7.80	8.25	8.30	8.15	8.00	8.15	8.25	8.30	8.50	8.40	8.25	8.20	8.25
1914	8.45	8.30	8.35	8.50	8.40	8.60	8.80	9.10	9.35	9.05	8.60	8.35	8.65
1915	8.05	7.50	7.65	7.70	8.35	8.80	9.20	9.05	8.95	8.80	8.70	8.35	8.40
1916	8.35	8.35	8.75	9.10	9.50	9.85	9.25	9.45	9.40	9.75	10.15	10.00	9.50
1917	10.15	10.50	11.25	11.75	11.90	12.15	12.35	12.70	13.10	11.70	11.10	11.40	11.60
1918	12.10	12.00	12.60	14.70	15.40	15.85	16.05	15.75	16.00	14.80	15.05	14.90	14.65
1919	15.80	15.95	16.05	15.85	15.00	13.55	15.60	16.45	15.50	16.15	15.10	14.35	15.50
1920	13.95	13.05	13.10	12.30	12.25	14.95	15.00	14.85	15.05	14.20	12.00	10.10	13.30
Average	$ 7.94	$ 7.89	$ 8.19	$ 8.42	$ 8.49	$ 8.77	$ 8.87	$ 8.97	$ 9.00	$ 8.71	$ 8.41	$ 8.12	$ 8.49

Monthly Average Prices for Aged Lambs at Chicago

1904-1920—17 Years

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1904	$ 5.55	$ 5.40	$ 5.30	$ 5.60	$ 5.70	$ 5.60	$ 6.15	$ 5.45	$ 5.15	$ 5.15	$ 5.50	$ 6.25	$ 5.60
1905	7.15	7.40	7.05	6.80	6.25	5.90	6.30	7.05	7.00	7.05	6.90	7.25	6.80
1906	7.25	6.75	6.40	6.20	6.65	6.75	6.90	7.00	7.15	6.95	6.90	7.10	6.85
1907	7.30	7.30	7.55	8.05	7.80	7.20	7.05	6.90	6.90	6.80	6.05	5.70	7.05
1908	6.80	6.70	7.20	7.25	6.65	5.75	6.20	6.05	5.35	5.50	5.85	6.70	6.35
1909	7.35	7.50	7.65	7.85	8.25	7.60	7.70	7.35	6.80	6.50	7.10	7.50	7.40
1910	8.30	8.65	9.40	9.10	8.40	7.60	7.10	6.70	6.80	6.65	6.25	6.10	7.55
1911	6.20	6.05	6.10	5.50	5.85	6.10	6.30	6.35	5.70	5.75	5.54	5.75	5.95
1912	6.50	6.15	7.30	7.95	8.30	6.90	7.25	7.10	7.00	6.75	7.15	7.75	7.20
1913	8.55	8.50	8.60	8.40	7.40	6.85	7.55	7.40	7.15	7.05	7.25	7.60	7.70
1914	7.90	7.60	7.65	7.60	8.10	7.95	8.45	8.15	7.80	7.60	8.75	8.30	8.00
1915	8.40	8.75	9.55	9.65	10.10	9.20	8.75	8.90	8.75	8.75	8.80	9.00	9.00
1916	10.30	10.90	11.10	10.45	10.75	9.55	10.55	10.75	10.60	10.15	11.40	12.70	10.75
1917	13.85	14.30	14.25	14.40	16.90	15.25	15.65	15.50	17.50	17.40	16.75	16.45	15.60
1918	17.20	16.60	17.55	19.20	18.00	16.85	18.50	17.50	17.25	15.35	15.10	14.60	16.60
1919	16.25	17.40	19.05	18.15	16.25	14.05	17.10	16.75	14.85	15.00	14.50	16.40	16.00
1920	19.50	19.95	18.80	18.80	17.40	14.25	15.55	13.20	13.30	12.35	11.70	11.20	14.60
Average	$ 9.67	$ 9.76	$10.03	$10.06	$ 9.93	$ 8.99	$ 9.59	$ 9.30	$ 9.12	$ 8.87	$ 8.91	$ 9.20	$ 9.35

Gestation Table

TIME ANIMAL DUE TO GIVE BIRTH

Time of Service	Cow 283 days	Sow 112 days	Mare 340 days	Ewe, 146 to 150 days
Jan. 1	Oct. 10	Apr. 22	Dec. 6	May 30
6	15	27	11	June 4
11	20	May 2	16	9
16	25	7	21	14
21	30	12	26	19
26	Nov. 4	17	31	24
31	9	22	Jan. 5	29
Feb. 5	14	27	10	July 4
10	19	June 1	15	9
15	24	6	20	14
20	29	11	25	19
25	Dec. 4	16	30	24
Mar 2	9	21	Feb. 4	29
7	14	26	9	Aug. 3
12	19	July 1	14	8
17	24	6	19	13
22	29	11	24	18
27	Jan. 3	16	Mar. 1	23
Apr. 1	8	21	6	28
6	13	26	11	Sept. 2
11	18	31	16	7
16	23	Aug. 5	21	12
21	28	10	26	17
26	Feb. 2	15	31	22
May 1	7	20	Apr. 5	27
6	12	25	10	Oct. 2
11	17	30	15	7
16	22	Sept. 4	20	12
21	27	9	25	17
26	Mar. 4	14	30	22
31	9	19	May 5	27
June 5	14	24	10	Nov. 1
10	19	29	15	6
15	24	Oct. 4	20	11
20	29	9	25	16
25	Apr. 3	14	30	21
30	8	19	June 4	26
July 5	13	24	9	Dec. 1
10	18	29	14	6
15	23	Nov. 3	19	11
20	28	8	24	16
25	May 3	13	29	21
30	8	18	July 4	26
Aug. 4	13	23	9	31
9	18	28	14	Jan. 5
14	23	Dec. 3	19	10
19	28	8	24	15
24	June 2	13	29	20
29	7	18	Aug. 3	25
Sept. 3	12	23	8	30
8	17	28	13	Feb. 4
13	22	Jan. 2	18	9
18	27	7	23	14
23	July 2	12	28	19
28	7	17	Sept. 2	24
Oct. 3	12	22	7	Mar. 1
8	17	27	12	6

Gestation Table (Continued)

TIME ANIMAL DUE TO GIVE BIRTH

Time of Service	Cow 283 days	Sow 112 days	Mare 340 days	Ewe, 146 to 150 days
Oct. 13	July 22	Feb. 1	Sept. 17	Mar. 11
18	27	6	22	16
23	Aug. 1	11	27	21
28	6	16	Oct. 2	26
Nov. 2	11	21	7	31
7	16	26	12	Apr. 5
12	21	Mar. 3	17	10
17	26	8	22	15
22	31	13	27	20
27	Sept. 5	18	Nov. 1	25
Dec. 2	10	23	6	30
7	15	28	11	May 5
12	20	Apr. 2	16	10
17	25	7	21	15
22	30	12	26	20
27	Oct. 5	17	Dec. 1	25
31	9	21	5	29

Estimating Age of Animals

Horses—The eruption of the incisor teeth, appearance of their wearing surfaces, and their form and relative position are the main indication of the horse's age.

Teeth	Age at Eruption		"Cups" disappear from wearing surfaces of permanent teeth of	
	Temporary	Permanent	Lower Jaw at	Upper Jaw at
Central Incisors	2-4 wks.	2½-3 yrs.	6 yrs.	9-10 yrs.
Intermediate incisors	6-8 wks.	3½-4 yrs.	7 yrs.	10-11 yrs.
Corner incisors	8-10 mos.	4½-5 yrs.	8 yrs.	11-12 yrs.
Canines (in males)	....	5 yrs.	....	....

"Cups" are depressions in the wearing surfaces of the teeth. In old horses teeth become rounded and slanting.

Cattle and Sheep—There are eight incisors in the lower jaw. The eruption of the permanent incisors indicates the age, and occurs about as follows:

	In Sheep at	In Cattle at
Middle pair	1 year	15-18 months
Second pair	2 years	24-27 months
Third pair	3 years	33-36 months
Corner pair	4 years	42-45 months

Methods of Curing Pork (Brine)

Trim off the ragged edges from the shoulders and hams. Heavy pieces may be skinned. Square up the bacon strip and flatten it out by striking with the side of a cleaver. Then thoroly rub all pieces to be cured with salt and allow them to remain over night in a cool (but not freezing) place. A standard recipe for curing 100 pounds of meat is salt, 10 pounds; sugar, 2 pounds; saltpeter, 2 ounces; water, 4½ gallons. Boil the mixture thoroly, remove the scum, and allow to cool. Pack the meat in a large jar, barrel or tight box and pour in the brine. Weight down the meat with a large stone. Remove and repack the meat on the fifth and fifteenth days. If the brine sours or becomes ropy remove the meat, wash it and put it back in a new brine mixture. Bacon from 200 to 250 pound hogs requires 25 to 30 days, shoulders 35 to 50 days and hams, 40 to 60 days. After removing from brine, soak the meat in fresh water for several hours and hang up to dry before smoking.

Curing Pork (Dry Cure)

The dry cure method is not quite as safe as the brine method but the meat is usually better flavored. Thoroly mix 5 pounds of salt, 2 pounds of sugar (brown, cane or molasses may be used), 2 ounces of saltpeter and pepper to suit the taste. This will cure 100 pounds of meat. Rub one-third of the cure into the meat and pack in a tight box or barrel. After three days remove it and rub in another third of the cure. Repack and after three more days rub in the remainder of the cure. Keep in the pack 12 to 15 days, then remove, wash, dry and smoke.

Smoking

Hang in the smoke house 6 or 8 feet from the fire. If possible use hard wood for the fire. Hickory or maple is best. Never use a resinous wood, as pine. Corn cobs are a good substitute for maple. Use sawdust, preferably hard wood sawdust to smother the fire. Smoke slowly for 24 to 36 hours in case of bacon and 60 to 90 hours in case of hams, depending upon the size. The meat may be left in the smoke house until fly time. Then it may be wrapped in paper or cloth and hung in a cool, dark place away from the flies or it may be wrapped and buried in the grain bin.

Sausage Making

Trimmings are usually used for sausage although the shoulders are also used occasionally. Sausage meat should consist of about one-fourth fat and three-fourths lean. Be sure there is no bone or gristle present. Grind, and then spread out in a large flat pan or on a table. The seasoning will depend upon the individual taste. A standard recipe is as follows: 4 lbs. meat, 5 teaspoonfuls salt, 6 teaspoonfuls sage, 2 teaspoonfuls white pepper, 1 teaspoonful ground cloves, 1 teaspoonful sugar, 1 teaspoonful baking soda, and ½ cup cold water. A little garlic may also be added. Of course, this recipe should be varied to suit the desires of the family. Many use only salt and pepper. Sprinkle on the seasoning and mix and knead with the hands, adding the water. Then run through the sausage grinder again. The meat may be stuffed into casings or muslin or fried down in a stone jar. If put in casings, a part of it may be smoked, as it will keep much longer than when unsmoked. The small intestines of the hog may be used for casings or they may be purchased from a local butcher.

Hamburger

Dry, tough beef may be ground up to make hamburger. Often times a little pork is also added. However, care should be taken to cook the hamburger thoroly before use when pork is present. After grinding, season with ½ lb. salt and 2 oz. pepper per 25 lbs. of meat. Mix and knead thoroly, adding about 2 quarts of water per 25 lbs. of meat. It then should be re-ground. Onions may be added before cooking.

Corned Beef

The plate is usually used for corned beef. It should be rolled and tied in pieces cut to a desirable size. Rub thoroly with salt and place in sweet pickle, using the recipe as already given for the brine method of curing pork. It may be taken out of the brine as used.

Dried Beef

Bone and separate the round into the three principal muscles. Rub thoroly with salt and pack and cure as with hams and bacon. Cure for 20 to 50 days, depending upon the size of the pieces. Smoke and pack for the summer as with hams.

Livestock Record Associations

HORSES—

Percheron Society of America—Ellis McFarland, Chicago, Illinois.

American Association of Importers and Breeders of Belgian Draft Horses—J. D. Connor, Jr., Wabash, Indiana.

American Clydesdale Association—R. B. Ogilvie, Chicago, Illinois.

The American Shire Horse Association—W. G. Lynch, Tonica, Illinois.

National French Draft Horse Association—C. E. Stubbs, Fairfield, Iowa.

American Suffolk Horse Association—A. Graham Galbraith, DeKalb, Illinois.

American Trotter Register Association—Wm. H. Knight, 355 Dearborn St., Chicago, Illinois.

American Saddle Horse Breeders' Association—R. H. Lilliard, Louisville, Ky.

American Shetland Pony Club—Julia M. Wade, Lafayette, Indiana.

CATTLE—

American Shorthorn Breeders' Association—F. W. Harding, Chicago, Illinois.

American Hereford Cattle Breeders' Association—R. J. Kinzer, Kansas City, Mo.

American Aberdeen-Angus Breeders' Association—Charles Gray, Chicago, Illinois.

American Galloway Breeders' Association—R. W. Brown, Carrollton, Mo.

The Polled Durham Breeders' Association—J. H. Martz, Grenville, Ohio.

American Polled Hereford Breeders' Association—B. O. Gammon, Des Moines, Iowa.

Red Polled Cattle Club of America—Harley A. Martin, Gotham, Wis.

American Guernsey Cattle Club—Wm. H. Caldwell, Peterboro, N. H.

Holstein-Friesian Association of America—F. L. Houghton, Brattleboro, Vt.

American Jersey Cattle Club—R. M. Gow, 324 W. 23 St., New York, N. Y.

Ayrshire Breeders' Association—J. M. Watson, Brandon, Vt.

Brown Swiss Record Association—Ira Inman, Beloit, Wis.

HOGS—

American Berkshire Association—Frank S. Springer, Springfield, Illinois.

American Poland-China Record Association—W. M. McFadden, Chicago, Illinois.

National Poland-China Record Association—A. M. Brown, Winchester, Indiana.

The Standard Poland-China Record Association—F. L. Garrett, Maryville, Mo.

The American Duroc-Jersey Swine Breeders' Association—Robert J. Evans, Chicago, Illinois.

The National Duroc-Jersey Record Association—J. F. Pfander, Peoria, Illinois.

The Chester-White Swine Record Association—F. F. Moore, Rochester, Indiana.

National Mule-Foot Hog Record Association—G. C. Kreglow, DeGraff, Ohio.

American Hampshire Swine Association—E. C. Stone, Peoria, Illinois.

The American Yorkshire Club—Harry G. Krum, White Bear Lake, Minn.

The American Tamworth Swine Record Association—E. N. Ball, Hamburg, Mich.

SHEEP—

American Shropshire Registry Association—Julia M. Wade, LaFayette, Indiana.

American Southdown Breeders' Association—Frank S. Springer, Springfield, Illinois.

American Hampshire Sheep Association—C. A. Tyler, Detroit, Mich.

American Oxford Down Record Association—W. A. Shafer, Hamilton, Ohio.

The American Cheviot Sheep Society—Edw. A. Stanford, Cooperstown, N. Y.

The Continental Dorset Club—Edith Chidester, Mechanicsburg, Ohio.

American Cotswold Association—F. W. Harding, Waukesha, Wis.

National Lincoln Sheep Breeders' Association—Bert Smith, Charlotte, Mich.

American Rambouillet Sheep Breeders' Association—Dwight Lincoln, Marysville, Ohio.

Standard Delaine Merino Sheep Breeders' Association—R. M. Wood, Douglas, Wyo.

American and Delaine Merino Association—S. M. Cleaver, Delaware, Ohio.

the summer as with hams.

Major Breeds of Dairy Cattle

		Ave % Butterfat	Ave. Lbs. Milk per Year
1.	Holstein-Friesian	3.43	14,443
2.	Ayrshire	3.93	9,417
3.	Guernsey	5.03	8,644
4.	Jersey	5.39	7,491
5.	Brown Swiss	3.7	

Minor Breeds of Dairy Cattle

1.	Dutch Belted	3.4
2.	Kerry	4.0
3.	French-Canadian	4.5

L. E. Roberts, "Correlation Between the Percentage of Fat in Cow's Milk and the Yield." Journal Agr. Research, Vol. XIX, No. 2.

Record Cows

Highest Butterfat Record Cow in Each Breed

Breed	Cow	Lbs. Milk	Lbs. Fat
Holstein	Duchess Skylark Ormsby	27,761	1205
Ayrshire	Lily of Willowmoor	22,596	956
Guernsey	Murne Cowan	24,008	1098
Jersey	Plain Mary	15,255	1040
Brown Swiss	College Bravura 2nd	19,461	798

Highest Milk Record Cow in Each Breed

Breed	Cow	Lbs. Milk	Lbs. Fat
Holstein	Tilly Alcartra	33,425	1058
Ayrshire	Garclaugh May Mischief	25,329	895
Guernsey	Murne Cowan	24,008	1098
Jersey	Passport	19,695	987
Brown Swiss	College Bravura 2nd	19,461	798

Records as of June 1, 1920.

Examples of Good Dairy Rations

No. 1

Roughage
- Alfalfa hay at will.
- Corn silage 30 to 40 lbs.

Grain mixed in proportion of
- 400 lbs. ground corn or ground barley.
- 200 lbs. ground oats or bran.
- 100 lbs. cottonseed meal

No. 2

Roughage
- Cowpea hay at will.
- Corn silage 30 to 40 lbs.

Grain
- 300 lbs. corn and cob meal.
- 200 lbs. bran or ground oats.
- 100 lbs. cottonseed meal.

No. 3

Roughage
- Clover hay at will.
- Corn silage 30 to 40 lbs.

Grain
- 500 lbs. ground corn.
- 500 lbs. ground oats.
- 150 lbs. cottonseed meal.

No. 4

Roughage
- Cowpea hay at will.
- Corn silage 30 to 40 lbs.

Grain
- 500 lbs. ground corn.
- 500 lbs. bran.
- 150 lbs. oil meal.

No. 5

Roughage
- Clover hay at will.
- Corn silage 30 to 40 lbs.

Grain
- 400 lbs. ground corn.
- 200 lbs. ground oats.
- 100 lbs. cottonseed meal.

No. 6

Roughage
- Clover hay at will.
- Corn stover at will.

Grain
- 400 lbs. ground corn.
- 200 lbs. ground oats.
- 75 lbs. oil meal.

Note: For Holsteins and Ayrshires feed about 2 pounds of grain for each gallon of milk produced.

For Jerseys and Guernseys feed about 2½ pounds of grain for each gallon of milk produced.

Digestible Nutrients Required per Day by a 1000-Pound Cow Giving Different Amounts of Milk

Milk Produced Daily	Digestible Nutrients Required		
	Protein Lbs.	Carbo-hydrates and Fats, Lbs.	Nutritive Ratio
10 pounds testing 3 per cent fat	1.23	9.35	1:7.6
20 pounds testing 3 per cent fat	1.61	11.45	1:7.1
30 pounds testing 3 per cent fat	2.03	13.58	1:6.7
40 pounds testing 3 per cent fat	2.43	15.58	1:6.4
50 pounds testing 3 per cent fat	2.88	17.80	1:6.1
60 pounds testing 3 per cent fat	3.28	19.93	1:6.0
10 pounds testing 4 per cent fat	1.25	9.74	1:7.8
20 pounds testing 4 per cent fat	1.77	12.26	1:6.9
30 pounds testing 4 per cent fat	2.30	14.78	1:6.5
40 pounds testing 4 per cent fat	2.80	17.31	1:6.2
50 pounds testing 4 per cent fat	3.33	19.82	1:6.0
60 pounds testing 4 per cent fat	3.80	22.37	1:5.8
10 pounds testing 5 per cent fat	1.33	10.16	1:7.6
20 pounds testing 5 per cent fat	2.00	13.08	1:6.8
30 pounds testing 5 per cent fat	2.55	16.31	1:6.4
40 pounds testing 5 per cent fat	3.10	18.93	1:6.1
50 pounds testing 5 per cent fat	3.70	21.87	1:5.9
60 pounds testing 5 per cent fat	4.32	24.81	1:5.9

Add .07 pounds protein and .72 pounds carbo-hydrates and fat for every 100 pounds the animal weighs above 1000 pounds.
Ill. Cir. 152.

Rations for Pure-Bred Cows on Official Test

Fitting Ration, mixed in the proportion of—

700 lbs. ground oats
400 lbs. hominy
300 lbs. oil meal

Test Ration, mixed in the proportion of—

125 lbs. ground corn
125 lbs. hominy
200 lbs. ground oats
200 lbs. wheat bran
150 lbs. oil meal

Remarks: Cows on test are usually given all the feed they will consume. The cow's appetite and capacity should be the guides determining the amounts of feed to be fed.

Amount of Feed Consumed by Dairy Heifers from Birth to One Year of Age

Feed	Group 1 20 Holstein Heifers	Group 2 29 Holstein Heifers	Group 3 40 Jersey Heifers	Group 4 20 Jersey Heifers
Whole Milk	244	499	465	342
Skim Milk	860	2786	2928	3165
Grain	1107	658	597	547
Hay	1067	768	709	857
Silage	1669	586	468	353
Corn Stover	....	28	40	....
Pasture (days)	....	128	122	123
Weights and Gains of Heifers				
Weight at birth	92	82	56	
Weight at 1 year	532	564	472	
Average daily gain	1.2	1.3	1.1	

Ill. Cir. 202.

Age for Dairy Heifers to Freshen

Breed	Breeding Age (Months)	Freshening Age (Months)
Holstein	18	27
Ayrshire	17	26
Guernsey	16	25
Jersey	15	24

Balanced vs. Unbalanced Rations for Dairy Cows

At the Illinois Agricultural Experiment Station 20 cows were divided into two lots. Lot 1 was fed a balanced ration. Lot 2 was fed an unbalanced ration. During the preliminary period both lots were fed a balanced ration. All of the cows were in good physical condition. The experiment continued for 131 days. Rations used:

Lot 1		Lot 2	
Corn silage	30 lbs.	Corn silage	30 lbs.
Clover hay	8 lbs.	Timothy hay	5 lbs.
Gluten feed	4⅔ lbs.	Clover hay	3 lbs.
Ground corn	3⅓ lbs.	Ground corn	8 lbs.
N. R. 1:6		N. R. 1:11	

Amount of Milk and Butterfat Produced by Each Lot and Difference per Cow per Day

	Pounds Milk			Pounds Difference per Day per Cow
	Lot 1	Lot 2	Difference	
Preliminary	2384.7	2279.3	105.4	1.7
131 days	39392.0	26839.8	12553.2	10.65
	Pounds Butterfat			Pounds Difference per Cow per Day
	Lot 1	Lot 2	Difference	
Preliminary	77.58	83.48	−5.90	−.09
131 days	1257.29	897.73	359.56	.305

The cows on the poor ration lost greatly in flesh during the test and their subsequent production was reduced.

Lot 1, receiving the balanced ration, produced approximately one-third more than Lot 2, receiving the unbalanced ration.

Ref., Ill. Bul. 159.

Grain Mixtures for Feeding Calves

No. 1

3 parts corn meal
3 parts ground oats
1 part linseed meal
1 part wheat bran

No. 2

5 parts whole oats
3 parts wheat bran
1 part corn meal
1 part oil meal

No. 3

100 pounds wheat bran
50 pounds oil meal
100 pounds oats

No. 4

10 parts ground corn
50 parts oats
30 parts wheat bran
10 parts oil meal

Ref., Ill. Cir. 202; Mo. Cir. 47; Mass. Bul. 164.

Grain Mixture for Bull

While Growing:

5 parts wheat bran
4 parts ground oats
1 part linseed meal

Mature:

3 parts corn meal
3 parts ground oats
3 parts wheat bran
1 part linseed meal

Suggested Calf Feeding Schedule Using Whole and Skim Milk

(Pounds of Milk per Day)

Days of Age	Jerseys		Holsteins	
	Whole Milk	Skim Milk	Whole Milk	Skim Milk
1	With dam	.....	With dam	.....
2	4	.....	6	.....
3 to 28	6 to 8	.....	10 to 12	.....
28 to 35	3 to 4	3 to 4	5 to 6	5 to 6
35 to 56	.....	8 to 10	.....	10 to 12
56 to 91	.....	10 to 12	.....	12

Ill. Cir. 202. U. S. D. A. Bul. 777.

RESULTS OF USING A PURE-BRED DAIRY SIRE

The Iowa Experiment Station is conducting a breeding experiment in which pure-bred bulls are used on grade stock. Scrub cows were purchased and developed. Results to date are as follows:

Average Production of Two Generations of Grades and Their Scrub Ancestors

Group	Dams		Daughters		Grand-daughters		Increase in Production 1st Generation		Increase in Production 2d Generation	
	Milk Lbs.	Fat Lbs.	Milk Lbs.	Fat Lbs.	Milk Lbs.	Fat Lbs.	Milk %	Fat %	Milk %	Fat %
Holstein	3673.8	167.36	6757.5	275.66	10063.2	385.46	84	65	174	130
Guernsey	4496.6	199.62	4843.8	229.74	7744.9	388.23	8	15	72	94
Jersey	3394.0	172.52	5460.5	298.00	5389.2	282.92	61	73	59	64
Average	3847.0	182.40	5944.7	261.93	8311.4	375.81	55	44	116	106

At the Illinois Experiment Station a Holstein bull, Emblagaard Tritomia Homestead, has sired some good daughters. To compare the two-year old records of the first ten daughters with the two-year old records of their mothers, the following table is given:

	Milk	Butterfat	% Fat
Daughters	13504.1	468.61	3.47
Mothers	9591.4	307.96	3.21
Difference	3912.7	160.65	.26

Dairy Cows and Other Classes of Live-Stock as Producers of Human Food

Pounds of Edible Dry Matter Produced from 100 Pounds Digestible Nutrients Consumed

Animal	Marketable Product, Lbs.	Edible Solids, Lbs.
Cow—(Milk)	139.0	18.0
Pig—(Dressed)	25.0	15.6
Cow—(Cheese)	14.8	9.4
Calf—(Dressed)	36.5	8.1
Cow—(Butter)	6.4	5.4
Poultry—(Eggs)	19.6	5.1
Poultry—(Dressed)	15.6	4.2
Lamb—(Dressed)	9.6	3.2
Steer—(Dressed)	8.3	2.8
Sheep—(Dressed)	7.0	2.6

Ref., Jordan—The Feeding of Animals.

Compared with other classes of live-stock, the dairy cow is the most efficient producer of human food.

Diseases of Dairy Cattle

Garget.—When certain bacteria gain entrance to the udder inflammation sets in, with the result that the tissues swell and become hard. The milk flow from the quarters affected is reduced and may be a thick, bloody or watery fluid. In mild cases the presence of the disease is not readily detected. When udder infection is suspected, the first two streams of milk which are drawn from each teat should be milked thru a fine wire gauze strainer. Thick milk indicating the presence of infection can thus be readily seen. Such milk should not be allowed to fall on the floor of the stalls, as it may be a means of conveying the disease to other cows, since garget is regarded as infectious.

To aid in preventing the spread of the disease it is well to milk the infected cows last, after which the hands of the milker should be thoroly washed; and if a milking machine is used, the teat cups should be thoroly disinfected. The cows' teats may also be treated after each milking with a disinfectant solution applied by holding a panful of the solution under the udder so that the teats are immersed for a few minutes.

The general treatment recommended for caked udder should also be applied, except that no camphor should be used in the salve.

Caked Udder.—At the time of calving there is usually some inflammation in the udder. When this is severe, the udder becomes hard or "caked." Other causes of inflammation are: injury to the teats, chilling of the cow by exposure to cold or storms, and the entrance of germs into the udder. In the latter case the trouble may be what is known as "garget."

In ordinary cases of caked udder, milking several times a day, followed by thoro rubbing and massaging of the udder with the hands, proves effective. In severe cases, where the milk is thick or stringy and very small in amount, more vigorous measures are necessary. The udder should be bathed with hot water for 20 to 30 minutes three or more times a day, and thoroly dried. Then some ointment, such as one of the following mixtures, should be applied:

No. 1

Gumcamphor	2 tablespoonfuls
Melted lard	1 teacupful
Extract of belladona	1 fluid ounce

No. 2

Fluid extract of poke root	1 part
Fluid extract of belladona	1 part
Turpentine	1 part
Melted lard, sweet oil, or cottonseed oil	5 parts

The udder should be kept warm by means of a blanket suspended under it, holes being cut for the teats if the udder is large and pendulous. In cold weather it may be necessary to blanket the cow to keep her warm.

The ration during this period should be laxative in nature and small in amount. If the bowels are not moving freely, a drench of Epsom salts should be given. In addition one ounce of saltpeter administered twice daily for two or three days in the drinking water or as a drench is also beneficial. A physic which will act sooner than Epsom salts alone may be compounded as follows:

Epsom salts	1 pound
Common salt	½ pound
Powdered ginger	1 tablespoonful
or blackstrap molasses	1 cupful

Ill. Cir. 204.

Sore Teats.—The causes of sore teats are numerous, one of the most frequent being chapping in cold

weather. Vaseline, oxide of zinc, or other good salve should be applied after each milking until the soreness disappears.

When teats are torn a powder composed of the following ingredients may be dusted into the sores to prevent infection and hasten healing.

Calomel	1 part
Subnitrate of bismuth	1 part
Boric acid	6 parts

Ill. Cir. 204.

Calf Scours (Indigestion)

Causes: Unwashed buckets; cold, damp, filthy pens; feeding artificial mixtures; over-feeding; feeding milk too rich; changing temperature of milk; too long time between meals; marked change in cow's feed.

Treatment: Remove the cause.

Remedies: (1) 2 oz. castor oil
(2) Scalded milk
(3) Raw eggs
(4) 2 parts subnitrate of bismuth, 1 part salol. Dose: Half tablespoonful at 6 hour intervals.

White Scours (Contagious)

No cure. Prevent by sanitation. Disinfect navel of calf with several applications of tincture of iodine.

Factors in the Cost of Corn Silage

Value of a Ton of Silage	
2.61 hours man labor @ 35c	$0.91
2.86 hours horse labor @ 20c	0.57
.2 hours engine and engineer labor @ $1.50	0.30
.35 pounds twine @ 24c	0.08
21.00 pounds coal @ 1/3c	0.07
.065% of $450 cutter cost	0.29
.064% of $250 binder cost	0.16
7.00% of $750 silo cost—110 tons	0.48
	$ 2.86
Add 1% for miscellaneous	.03
	$ 2.89
5 bu. corn @ $1.20 (market value $1.33)	6.00
Stover ($2.00 an acre)	.25
Total	$ 9.14
Add 1/5 to allow for 1/6 loss in weight	1.83
	$10.97

Note: The above prices are arbitrary. Use current prices in figuring cost of silage.

Capacities of Round Silos in Tons Settled Silage

Height of Silage	Diameter of Silos in Feet —12—	—14—	—16—	—18—	—20—
4	6.0	8.16	10.66	13.48	16.64
5	7.64	10.4	13.58	17.2	21.2
6	9.34	12.7	16.6	21.0	25.92
7	11.1	15.1	19.72	24.96	30.8
8	12.88	17.56	22.92	28.90	35.78
9	14.78	20.10	26.28	33.28	41.1
10	16.7	22.72	29.8	37.6	46.4
11	18.7	25.45	33.3	42.1	51.92
12	20.72	28.2	36.85	46.61	57.6
13	22.86	31.1	40.7	51.4	63.44
14	23.9	34.0	44.5	56.24	69.44
15	27.2	37.0	48.4	61.35	75.6
16	29.5	40.1	52.4	66.4	81.92
17	31.84	43.35	56.56	71.6	88.4
18	34.22	46.6	60.8	77.0	95.0
19	36.69	49.9	65.2	82.5	101.9
20	39.2	53.3	69.6	88.2	108.8
21	41.75	56.9	74.2	94.0	116.0
22	44.4	60.4	78.9	99.8	123.3
23	47.1	64.0	83.6	105.8	130.6
24	49.8	67.7	88.6	112.0	138.3
25	52.6	71.6	93.5	118.3	146.0
26	55.4	75.4	98.4	124.7	153.9
27	58.4	79.4	103.7	131.3	162.0
28	61.4	83.4	109.1	138.0	170.4
29	64.4	87.6	114.4	144.8	178.64
30	67.4	91.7	119.8	151.7	187.3
31	70.6	96.0	125.5	158.8	196.1
32	73.8	100.4	131.2	166.0	205.0
33	75.7	104.8	136.9	173.4	214.0
34	80.3	109.3	142.7	180.6	223.0
35	83.65	113.9	148.7	188.3	232.3
36	87.2	118.5	155.0	195.8	242.0
37	90.7	123.5	161.2	204.0	252.0
38	94.2	128.2	167.5	212.0	261.6
39	97.8	133.0	173.6	220.0	271.4
40	101.4	138.0	180.5	228.1	282.0
41	105.2	143.2	187.0	236.7	292.0
42	109.0	148.3	193.5	245.0	302.7
43	112.8	153.5	197.5	253.8	313.2
44	116.6	158.8	206.2	262.5	324.2
45	120.5	163.5	213.5	271.2	335.0
46	124.3	169.2	220.1	280.1	345.8
47	128.6	174.9	228.7	289.2	356.8
48	132.7	180.6	236.0	299.0	369.0
49	136.8	186.3	242.1	308.1	380.1
50	141.3	192.4	250.2	318.5	392.9
51	145.1	197.4	256.9	326.6	406.9
52	149.0	204.0	266.4	337.2	416.0
53	154.3	209.9	272.9	346.9	427.9
54	158.6	215.7	281.1	357.0	440.8
55	162.4	221.1	290.3	365.5	451.2
56	167.8	228.3	298.2	377.7	466.0
57	172.4	234.7	305.2	388.1	479.0
58	176.9	240.9	313.1	398.5	491.9
59	182.1	247.8	322.1	409.9	503.1
60	186.5	254.0	331.8	420.0	518.4

Note: To find tons of silage remaining in silo, first find tons in silo when filled; second, find tons of silage removed (which will be that of silage contained in a silo filled to a height equal to the depth of the removed silage), then subtract this from the first result and the remainder will be the tons of silage remaining in silo.

Mechanical vs. Hand Milking

Comparison of Net Expense to Care for Cows in Herds of Different Sizes Where Mechanical and Hand Milking is Practiced

Class	No. of Herds		No. of Cows		Ave. No. Cows per Herd		Hours Man Labor per Cow		Net Expense per Cow	
	Hand Milk.	Mech. Milk.	Hand Milk.	Mech. Milk.	Hand Milk.	Mech. Milk.	Hand Milk.	Mech. Milk.	Hand Milk.	Mech. Milk.
20 or less	12	9	159	147	13.25	16.33	143.61	111.67	$24.204	$23.618
21-30	12	9	303	231	25.25	25.67	137.98	103.47	23.254	21.722
Over 30	10	12	360	455	36.	37.92	131.18	79.27	22.108	17.0865
Totals	34	30	822	833	24.18	27.77	136.0885	91.70	$22.9358	$19.5246

Pearson and Ross, Ill. Unpublished Data.

A cow testing association may, in time, be used by its members as an agency for the cooperative buying and selling of feeds, stock, etc.

Ill. Cir. 196.

Number of Cow Testing Associations in United States July 1, 1920—468.

In Illinois July 1, 1920—23.

Cooperative Dairy Bull Associations

A Dairy Bull Association is an organization for the purpose of cooperative ownership of pure-bred dairy bulls. The bulls purchased by the Association are distributed among the members in different territories. Each territory is called a "Block" and one bull is assigned to each "Block". At the end of each two years the bulls in the various "Blocks" are exchanged to prevent in-breeding; that is, if there are four "Blocks" in the Association, each of the four bulls serves two years in each "Block", thus making the period of usefulness of each sire eight years.

U. S. D. A. Bul. 993.

Illinois Standards for Milk and Its Products

"Milk shall contain not less than three (3) per cent of milk fat and not less than eight and one-half (8½) per cent of solids not fat."

"Cream shall contain not less than eighteen (18) per cent of milk fat."

"Ice cream is a frozen substance, made from cream, or milk and cream, and sugar, with or without the additions of such other wholesome substances as have customarily been used in making ice cream, and contains not less than eight per cent (8%) milk fat; and is manufactured, stored, distributed and dispensed in a sanitary manner."

Average Composition of Milk

Water	87.1
Fat	3.9
Milk sugar	4.8
Casein	3.0
Albumen	0.5
Ash	0.7
Total	100.
Solids not fat	9.0
Total solids	12.9

Food Value of Milk

Weights of Foods Containing an Amount of Protein and Producing Energy Equivalent to One Quart of Four-Percent Milk

	Protein	Total Energy
Sirloin steak	6 1/3 oz.	11 oz.
Round steak	5 2/5 oz.	16 1/5 oz.
Pork chops	7 4/5 oz.	8 3/5 oz.
Ham, lean smoked	6 oz.	9 4/5 oz.
Fowl	7 3/5 oz.	14 oz.
Eggs	4 2/5 oz.	8 9/10 oz.
Halibut steak	6 4/5 oz.	23 oz.
Mackerel, salt	6 2/5 oz.	10 1/2 oz.
Salmon, dressed	7 3/5 oz.	18 1/5 oz.
Whitefish	9 9/10 oz.	33 3/5 oz.
Full cream cheese	3 1/10 oz.	5 2/5 oz.
Cottage cheese	5 oz.	21 1/5 oz.
Dry beans	4 7/10 oz.	6 3/4 oz.
Baked beans, canned	15 1/5 oz.	18 oz.
Dry peas	4 1/4 oz.	6 1/2 oz.
Canned peas	29 oz.	42 oz.
Rolled oats	6 3/10 oz.	5 4/5 oz.
Peanut butter	3 3/5 oz.	4 1/5 oz.

Ill. Cir. 235.

Cost of Milk Production

So-called "Pearson Formula"

Year cost of milk production per cwt.:

Grain	44 lbs.
Hay	50 lbs.
Silage	188 lbs.
Other roughage	39 lbs.
Man labor	2.42 hours

Above formula has been modified as follows:*

Grain	44 lbs.
Hay	110 lbs.
Labor	3 hours

Seasonal Variation in the Cost of Production

Month	Percentage Variation
January	119.0
February	114.3
March	106.5
April	94.2
May	73.2
June	70.6
July	83.7
August	94.2
September	96.7
October	109.2
November	118.3
December	130.3

Ill. Bul. 216.
*Was modified by Chicago Milk Commission.

How the Dairyman Spends His Dollar in Producing Milk

	Cents
Feed other than pasture	60.74
Pasture	5.31
Man labor	16.99
Interest on herd	4.88
Miscellaneous	3.80
Horse labor	3.44
Buildings	3.57
Equipment	1.27

Ill. Bul. 216.

Cattle Lice

Apply raw linseed oil with brush to affected parts. Repeat in ten days. Disinfect stalls and pens with a 4% solution coat tar dip.

Dehorning Calves

Use caustic potash on rudimentary horns. Clip the hair over the horns. Moisten a place the size of a quarter and apply caustic.

Fly Repellent Mixture

Lard, 1 gallon.
Sulfur, 2 pounds.
Kerosene, 1 pint.
Apply with cloth or brush.

Official and Semi-Official Testing

When a breeder desires to enter any cattle on test he should make application to the breed association for permission to test. The addresses of the associations are as follows:

Holstein—M. H. Gardner, Supt. A. R., Delavan, Wisconsin.

Jersey—Advanced Registry Division, American Jersey Cattle Club, 324 West 23rd Street, New York.

Guernsey—Advanced Registry Division, American Guernsey Cattle Club, Peterboro, N. H.

Ayrshire—Advanced Registry Division, Ayrshire Breeders' Association, Brandon, Vermont.

Brown Swiss—Ira Inman, Beloit, Wisconsin.

Besides making application to the breed association, the breeder should write the Superintendent of Official Testing, Department of Dairy Husbandry, Urbana, Illinois, at least two weeks before the test is to be started to make arrangements for a supervisor.

A breeder is required to furnish the supervisor with transportation from the station to the farm in time for the first regular milking after he arrives, and to return him to the station at the close of the test. The breeder shall furnish satisfactory board and room for the supervisor during the entire test period. The equipment to be furnished by the breeder is a Babcock tester, sample bottles, bottle caps, two milk pails, a dipper and sulphuric acid. The tester must not be less than the 12-bottle size if the maximum number of cows is to be run on test at one time. The bottles should not be less than ½ pint in size, and should be supplied with tight fitting caps, paper caps being most satisfactory. The commercial sulphuric acid is to be used for testing and can be secured through a local drug store or creamery.

The breeder should furnish a satisfactory place for the supervisor to work. The room should be warm in winter; hot water should be convenient, and the tester should be placed on a solid bench.

A supervisor may test the following number of cows at one time: Six cows, milking four times per day; eight cows, milking three times per day; and twelve cows, milking two times per day.

A flat rate is made to all breeders for testing work. The following charges are made:

Seven-day test—$35, with $4.50 for each additional day.

Two-day test—$12, with $4.50 for each additional day.

One-day test—$10.

Further information will be furnished thru the Agricultural College, Dairy Department, or thru the breed associations with addresses given above.

Fumigants

Carbon Bisulphid — The best fumigant to use for treating masses of grain in bins and for rodents or underground animals.

Should be used at the rate of 1 lb. to each 100 cu. ft. of space to be treated. Is best applied by pouring on gunny sacks pushed into the upper layers of the grain; by pouring out in shallow dishes set over the grain; or may be poured directly over the grain. For rodents pour from ¼ to 1 lb. down the burrows of the animals.

CAUTION — This gas is highly inflammable; is poisonous; should never be used at temperatures below 60° F; buildings treated with it must be tight.

Hydrocyanic Acid Gas—The best fumigant to use for empty grain bins, grain elevators, dwelling houses, stores and storerooms.

Should be used at the rate of 1 oz. sodium cyanide, 2 oz. commercial sulfuric acid, and 4 oz. water to each 100 cu. ft. of space. Place the water in a glass or earthen jar, slowly add the acid, and last, drop in the cyanide wrapped loosely in paper, leaving the building or room immediately.

CAUTION—This gas is one of the most poisonous substances known and extreme caution should be used in handling it; buildings treated must be tight; it should not be used at temperatures below 50° F.

Repellents

Some substances have marked repellent effects upon certain insects. Chief of these are creosote derivatives, such as napthalene flakes, moth balls and crude creosote.

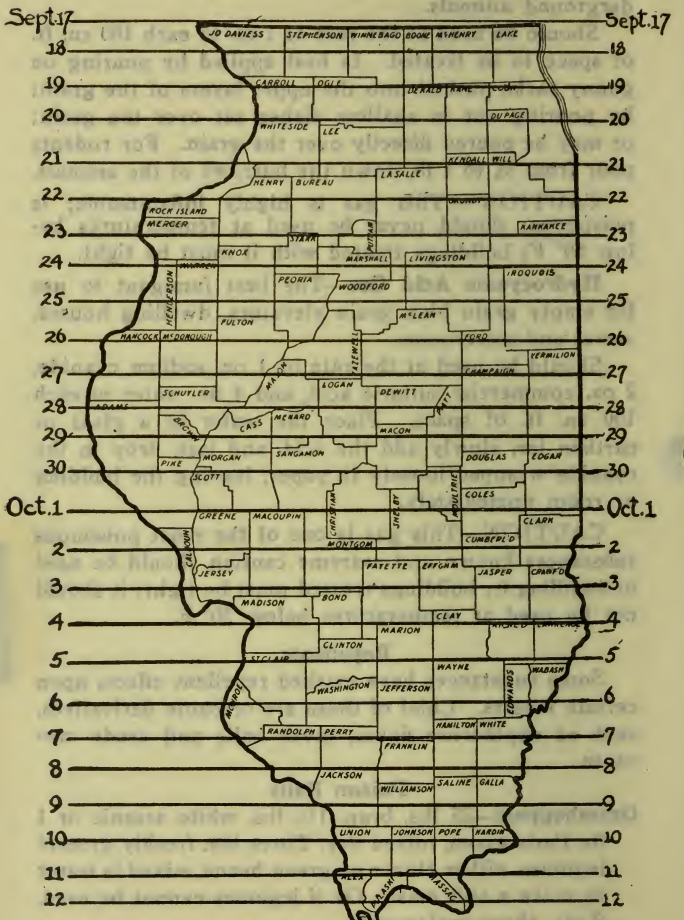
Poison Baits

Grasshoppers—25 lbs. bran, 1¼ lbs. white arsenic or 1 lb. Paris green, mixed dry. Three lbs. freshly ground legumes, either clover or green beans, mixed in water to make a stiff mash. Or if legumes cannot be used, 2 qts. cheap molasses.*

Army-worms and Cutworms—25 lbs. bran, 1¼ lbs. white arsenic or 1 lb. Paris green, mixed dry. Water to make stiff mash in which has been stirred 2 qts. cheap molasses, black strap preferred.*

*Where possible to obtain it, white arsenic should be used, as it is fully as effective and much cheaper in price.

Fly-Free Dates for Illinois



Recommended dates for wheat seeding in order to escape severe damage by the Hessian fly and still be early enough to enable the plants to make sufficient growth to withstand the winter.

Insect—1. San Jose Scale

Crops Attacked—Apple, peach, plum, pear, currant, sweet cherry, gooseberry, several ornamental shrubs.

Character of Injury—Reddish spots on bark of trunk and branches; or a grayish coating over the bark, giving the tree the appearance of having been sprinkled with ashes.

Life History—Passes winter in half grown stage on bark of tree. Begins giving birth to living young about the time trees blossom. The insect is minute in size, circular in shape, and covered with a sooty grayish scale. The insect itself is lemon yellow and lives by sucking the sap of the branches, twigs, leaves and fruit. There are three to five generations each season. The scale multiplies at such a rate that there may be 32,000,000 offspring from one female in a single season.

Control—Spray in the spring when buds just show green, using commercial lime sulfur at 1:8. Miscible oils at strengths recommended by manufacturers. Soluble sulfur at 12½ lb. to 50 gal. water. Dry lime sulfur at 15 lb. to 50 gal. water.

Insect—2. Codling-Moth

Crops Attacked—Apple, pear, quince.

Character of Injury—Worm holes in sides and ends of fruit.

Life History—Passes winter as a worm in a cocoon under bark on trunk of tree and in piles of rubbish in or around orchard. It changes to the brown resting stage and emerges from April 15 to June 15, depending on the section of the state, as a small grayish moth with brown markings. The moth lays its eggs on the leaves. The young worms hatching from them enter the apples usually at the calyx or blossom end, starting generally about three weeks after the blossoms have fallen. They complete their growth in the apple in from three weeks to a month, come down the trunk of the tree and again complete their transformation to the moth. There is a partial second brood in all parts of the state and a partial third brood in the south part of the state. The second brood appears in southern and central Illinois about July 1 to 20; in northern Illinois from July 25 to 30. The third brood appears in southern and central Illinois from Aug. 10 to 20.

Control—Spray with arsenate of lead at rate of 1 lb. powdered to 50 gal. water first when the petals are ¾ off; 21 days later; 9-11 weeks later; 14-15 weeks later. Time of application of last two sprays will vary with the appearance of the codling-moth broods. Date of appearance of these broods is given to farm advisers two weeks in advance each season. In some seasons additional sprays are required.

Insect—3. Plum-curculio

Crops Attacked—Apple, plum, pear, peach, cherry, apricot.

Character of Injury—Semi-circular and circular cuts or punctures in the sides of fruits. Mis-shapen, lopsided fruit. Fruit falling from trees during June.

Life History—Passes winter in adult stage, hiding under trash and leaves. In this stage it is a brown snout beetle about ¼ inch long, rather robust in appearance, with irregular whitish markings on the back, and hard knob-like protuberances, one on each wing cover. It leaves winter quarters about the time the trees blossom, feeds upon the newly formed fruit, and deposits its eggs in small semi-circular cuts in the green fruits. These hatch into grub-like pinkish white worms which when full grown are about 1/3 inch long. They then leave the fruit, which has generally fallen to the ground, and burrow in the ground for an inch or two forming a small cell, and after about a month emerge as full grown beetles. The beetles feed for some time on the growing fruit, injuring it by the punctures made with their beaks. At the approach of cool weather they seek shelter in which to hibernate.

Control—On apple and pear this insect is controlled by thoro spraying and clean cultivation. The spray schedule should be the same as for the codling-moth, but where the curculio is very abundant the amount of arsenate of lead should be doubled. Special attention should be given to the summer sprays. Trees should be

pruned to admit light, and undergrowth around the orchard cut down. Cultivate the orchard for about six weeks after the apples begin to drop. Keep the orchard clean and open to reduce hibernating quarters. On plums, apricots and cherries spray soon after the fall of the bloom and again 10 days to 2 weeks later. On peach the first application is made as soon as the shucks drop from the fruit; 3 weeks later; and on late varieties 6 to 7 weeks later.

Insect—4. Spring Cankerworm

Crops Attacked—Apple, pear, plum, elm, hackberry, linden.

Character of Injury—Trees stripped of leaves early in the season. Leaves skeletonized leaving mid-ribs and larger veins. Webs over branches and limbs of trees.

Life History—Passes winter in pupal stage in ground under the trees about 1 to 2 inches below the surface. Adults emerge from the latter part of February to the first week in April. The males are grayish moths with well developed wings and are strong fliers. The females are nearly wingless and unable to fly. The females crawl up the trunks of trees and lay their eggs in masses of 25 to 100 under loose scales of the bark. These eggs begin hatching about the time that the foliage appears. The young worms, which are grayish or brownish black, have the peculiar looping habit of all measuring worms. They spin down from the trees if the branches are jarred. The worms become full grown in about 3 to 4 weeks, depending on the weather. They then drop or crawl to the ground and construct cells in the earth in which they pupate, and remain in this stage until the following spring.

Control—Spray with arsenate of lead at the rate of 2 lbs. powdered to 50 gal. water when the leaves are ¼ inch across; repeat one week later. Bands of tanglefoot or other sticky material 4 inches wide placed around the trunks of the trees by the middle of February will stop the females from ascending the trees and laying their eggs. Sometimes controlled by parasites.

Insect—5. Peach-Tree Borer

Crops Attacked—Peach.

Character of Injury—Gummy sap mixed with brown sawdust oozing from wounds in trunk of tree near surface of the ground. Sudden dying of trees after foliage has come out in the spring.

Life History—Passes winter as a partly grown larva in the inner bark or wood of the trunk, nearly always just below the surface of the ground. The worms vary in length from ¼ inch to nearly 1 inch, are dirty white with dark brown heads and a brown shield just behind the head. They become active about the time the peach trees bloom and by the first of June the larger worms become full grown, change to a brown pupal stage, and emerge from the middle of June to middle of September as clear winged black and yellow moths having somewhat the appearance of large wasps. These moths are strong fliers, and can travel considerable distances. The female lays her eggs in cracks in the bark around the bases of trees or in the ground within 1 or 2 inches of the trunk. These eggs are hatching from the last of July to the middle or last of September. In most cases there is one full brood each season, altho some of the insects may take two seasons to complete their growth.

Control—Mound the earth around the trees during the egg laying period of the moths. Remove earth and dig out borers in October and again during the last week in May and first week in June. Use sharp pointed knife. Cut carefully with the grain of the wood. Paint the wounds with strong lime sulfur.

Insect—6. Apple-Aphis

Crops Attacked—Apple, pear, quince.

Character of Injury—Green insects clustered on new growth. Leaves curled. Apples mis-shapen and dwarfed.

Life History—There are three species of aphids commonly found on the apple, two of which are moderately injurious to the fruit and foliage, the other being practically harmless. They pass the winter in the form of greenish eggs tightly fastened on the twigs and small

branches of the trees. The eggs are most numerous at the axils of the twigs, around old scales or depressions in the bark caused by injuries. They begin hatching in the spring just before the leaf buds are bursting. The young aphids cluster on the outside of the buds sucking the sap from the opening leaves and if abundant causing them to curl. The rosy aphis and green aphis frequently attack the young fruit causing it to become hard and mis-shapen. Apples which have been fed upon practically cease growing. During the summer the aphids reproduce by giving birth to living young. After about the second generation, in the case of the oat aphis which is practically harmless, and at the end of the third and fifth generations with the green or rosy aphis, most of the insects develop wings and leave the trees to feed upon grass, weeds or grains, returning again at the approach of cold weather in the fall at which time the true sexes appear and the females deposit the overwintering eggs.

Control—The insects are held in check by a number of natural enemies chief among which are young Syrphid or sweat flies, aphis lions, and lady bugs. When these natural enemies are abundant early in the spring it is not necessary to take artificial measures for control. Nearly complete control may be obtained by spraying, just as the buds are opening, with 40% nicotine sulfate solution at one part to 800 parts water or lime sulfur solution. If used with water alone greater killing power is obtained by adding 1 lb. of soap to each 25 gal. of the solution. Kerosene emulsion at 5% strength may be used, but there is great danger of burning foliage.

Insect—7. Oyster-shell Scale

Crops Attacked—Apple, quince, plum, pear, ash, poplar, lilac, soft maple, dogwood.

Character of Injury—Deadening of branches. Bark covered with hard brown scales having the appearance of small oyster shells.

Life History—Passes winter in the form of a minute whitish egg under a reddish brown scale about ⅛ inch long, closely attached to the bark of the tree. The scale has very much the appearance of a small oyster shell and on heavily infested trees frequently entirely covers the surface of the bark, with many of the scale somewhat overlapping their neighbors. From 50 to 100 eggs are found under each female scale. Eggs hatch during the late spring, the young being very minute. They crawl about for several hours and then insert their small beaks into the bark and begin feeding upon the sap, the female never moving from the position first taken. The male develops into a dark two-winged insect which lives for only a few hours in the adult stage. After mating the female deposits her eggs underneath the scale and dies soon after.

Control—This scale is very difficult to control. Spraying with dormant strength lime sulfur just as the buds are opening in the spring, while it does not prevent the eggs from hatching, will greatly lessen the set of the young scale. Parasites are of some importance in controlling this scale.

Insect—8. Scurfy Scale

Crops Attacked—Apple, pear, quince, cherry, plum, currant, gooseberry, several other trees.

Character of Injury—Flattened grayish white scales sprinkled on, or entirely covering, bark of twigs and branches.

Life History—Passes winter in the form of reddish egg sheltered beneath a small, white, flattened, pointed scale closely attached to the bark of the tree. The pointed end of the scale is reddish or reddish brown, the remainder being white or grayish. As an average, about 50 eggs are found beneath each of the scales. The life history is essentially the same as that of the oyster-shell scale.

Control—Same as for oyster-shell scale. Parasites are of some importance in controlling this scale.

Insect—9. Buffalo Tree-Hopper

Crops Attacked—Nearly all fruit and many shade and woodland trees.

Character of Injury—Curved slits about ¼ inch long in bark of trees. General scarred and roughened appearance of bark of trees.

Life History—Passes winter in the form of elongated yellowish eggs placed side by side in small incisions made in bark of the branches or the trunks of small trees. The eggs hatch during May. The young insects, which are green and covered with numerous spines, leave the tree shortly after hatching, drop to the ground and feed on the grasses and weeds in the vicinity. They become full grown late in the summer at which time they are much the size and shape of a beech-nut, without the projecting spines of the young, and bright green. The females lay their eggs in the slits which they make with their sharp ovipositors in the bark of the tree. These slits do not heal readily and a tree in which many eggs have been laid is often badly scarred and the growth stunted.

Control—The only practical control is clean cultivation of the orchard, keeping down the growth of grass and weeds in the vicinity of the trees. No spray can be applied to the trees that will kill the eggs after they are deposited under the bark. Prune and burn all heavily infested branches before April 1.

Insect—10. Fruit Bark-beetles or Shot-hole Borers

Crops Attacked—Apple, peach, pear, plum, quince, cherry, apricot, prune, several other trees.

Character of Injury—Small holes, about the size of a No. 6 shot, in the bark especially around the buds and axils of branches. Deadening of branches or entire trees.

Life History—They pass the winter as small black or brown beetles, or small grubs or larvae rather pinkish white in appearance, occurring in the inner bark and sap wood of the tree. They are very small, about ⅛ inch long by half that width, the body generally curled in a semi-circle. They change to very small cylindrical black or brownish beetles about ⅛ inch long, which begin emerging in April and May. The beetles mate and the females eat out irregular galleries thru the bark, generally starting just under the axil of a small twig. The females lay their eggs along the sides of these galleries and these eggs hatch into the young grubs already described. There are two or three generations each year, depending on the species.

Control—Beetles normally attack only weakened trees. Keep all trees in a vigorous condition. If weakened trees are found showing the work of the insect they should be cut and carefully burned during the winter, as if allowed to become abundant in an orchard the beetles will attack many trees that otherwise would escape. Burn all freshly pruned wood.

Insect—11. Woolly Aphis

Crops Attacked—Apple, elm.

Character of Injury—Knot-like galls on the roots. Masses of aphids covered with a white cottony wax on trunk and branches of trees.

Life History—Passes winter in the form of a black egg in crevices in the bark of trees. These eggs which hatch very early in the spring produce only female aphids and these begin giving birth to living young within two or three weeks after the time of hatching. They multiply with extreme rapidity so that by the first of April large numbers can be found generally in wounds or cracks on the trunk and also underground upon the roots of trees. The insect causes most serious injuries to young orchards and nurseries, its feeding punctures on the roots causing large knot-like swellings. A number of generations are produced during the summer, all of which are wingless females. In the early fall winged individuals are produced. These make short flights to uninfested trees and give birth to the true sexes which mate, the female laying a single egg in a crevice in the bark.

Control—This insect is extremely hard to control. Trees may be dipped in a 10% solution of kerosene emulsion or 40% nicotine sulfate at one part to 200 parts water. The latter may be poured around the roots of the trees in orchards. Spray trunks of infested trees with kerosene emulsion or tobacco solution. Parasites are important in the control of this insect.

Insect—12. Southern Corn Root Worm

Crops Attacked—Corn, beans, melons, and many other crops.

Character of Injury—Slender grayish white worms burrowing in the roots and underground stems of food plants.

Life History—Passes winter as an adult, and is active during warm periods in the winter and early in the spring. The eggs are laid in the soil of fields where the food plants are present. The young worms on hatching work their way to the roots where they feed until full grown. They change in small cells in the soil to soft white pupae and later emerge as yellow beetles with twelve black spots on the wing covers, arranged in rows of four. There are probably two broods over most of this state. The first brood reaches maturity during June and July.

Control—Fall plowing followed by spring fallowing, and late planting. Rotation has very little effect. Early spring plowing and late planting.

Insect—13. Striped Cucumber-beetle

Crops Attacked—Cucumber, squash, melon, pumpkin.

Character of Injury—Irregular feeding punctures in leaves and stems of plants. Wilting of the plants caused by cylindrical worms in the stems and roots. Striped yellow and black beetles on the leaves and stems.

Life History—Passes winter in the adult stage in nearly any sort of cover which affords it shelter. It is generally most abundant in the vicinity of pumpkin, squash or cucumber fields, especially where pumpkins or squashes have been allowed to remain in the field. The beetles become active early in the spring and are strongly attracted to cucurbits. They congregate on these plants in large numbers feeding upon the leaves and stems and depositing their eggs in the ground around the stems of the plants. The small white worms hatching from these eggs burrow in all parts of the stem and roots under ground, frequently entirely destroying the root system. On becoming full grown they change to white pupae in the soil and begin emerging again as beetles by the latter part of June. The beetles feed on the flowers of a large variety of plants, and on the melons and squashes in the fields, going into hibernation at the approach of cool weather in October.

Control—Spray young vines with arsenate of lead at rate of 1 lb. of powdered to 25 gal. water. Apply this spray so as to cover the under sides, as well as the tops, of the leaves. Protect vines with a light frame covered with cheese-cloth until they are 3 feet long.

Insect—14. Melon Aphis

Crops Attacked—Melon, cucumber, squash, pumpkin, several other crops.

Character of Injury—Small blackish green aphids appearing on the under sides of the leaves of cucurbits sucking the sap and causing the leaves to curl and plants to wither and die.

Life History—The stage in which the insect passes the winter is not known. It generally appears in this state in July. In common with most aphids, all of the summer forms are females. They reproduce by giving birth to living young and increase very rapidly. A small infestation will spread thruout a field within a few weeks. The insects feed almost entirely on the undersides of the leaves, sucking the sap, curling the leaves and killing the plants.

Control—Spray as soon as the aphids appear, using 40% nicotine sulfate at one part to 800 parts water, with 1 lb. soap to each 25 gal. water. Apply with considerable force to the undersides of the leaves, as it is necessary to wet the bodies of the aphids in order to kill them. Parasites are important in the control of this insect.

Insect—15. Flea-beetles

Crops Attacked—Cabbage, eggplant, potato, tomato, sweet potato, many other crops.

Character of Injury—Minute holes eaten thru the leaf surface. Browning and drying up of the leaves. Appearance of burning.

Life History—They pass the winter as small to very small beetles, hiding under leaves or rubbish about the margins of gardens, roadsides, etc. Insects become active early in the spring, feeding on plantain, the foliage of a number of trees, and several of the different weeds and grasses. When cultivated crops mentioned are grown in the vicinity where beetles are present they congregate in large numbers on such crops, feeding upon the leaf surface and depositing their eggs in the soil. The larvae work in the soil upon the under-ground stems of plants and the roots of various crops and weeds. There are from one to three broods each year, the overwintering adults being abundant up to the first of July, when there is a period of scarcity, and another period of abundance from the first of August thru September, when the new brood of beetles appear. All of the flea-beetles are strong, active jumpers.

Control—Spray plants when the beetles appear with a solution of arsenate of lead at the rate of 1 lb. powdered to 20 gal. water; or with Bordeaux mixture of 4-4-50 formula. On cabbage use lead arsenate with 1 lb. soap to 25 gal. spray.

Insect—16. Asparagus Beetle

Crops Attacked—Asparagus.

Character of Injury—Small dark green worms or shiny blackish beetles feeding upon the tops of the new growth and on the leaves. Stunting, dwarfing, and mis-shaping of the new growth.

Life History—Passes the winter as a beetle hiding in rubbish, leaves and trash around gardens. These beetles are about 1/3 inch long, and highly colored, the wing covers being yellow and bluish black with orange margins. They deposit their eggs in rows on the leaves, stems and stalks of the new growth of the asparagus. The eggs hatch into dirty greenish larvae, somewhat resembling snails, which feed ravenously on the asparagus leaves and on the tips of the new growth. The full grown larvae enter the ground and transform in about two weeks to the adult beetles. There are from three to four generations each year thruout the greater part of this state.

Control—Spray with arsenate of lead at rate of 3 lbs. powdered to 50 gal. water; 2 lbs. soap added to the above solution will cause spray to adhere more readily to the plants. Leave plants uncut in different parts of the field. The beetle will tend to congregate on these larger plants which can be kept thoroly sprayed. Parasites are important in the control of this insect.

Insect—17. Cabbage-Worm

Crops Attacked—Cabbage, cauliflower, sometimes radish, turnip, rape, kohlrabi, nasturtium, monks-hood, and some other plants.

Character of Injury—Irregular holes eaten out of leaves of food plants. Dark green caterpillars on leaves.

Life History—Passes winter in the form of a grayish brown or brown chrysalis or pupa attached by silken threads to the undersides of boards, fence rails and sides of houses. Transforms during April and May to a white butterfly with a wing expanse of about 1½ inches. The tips of the front wings and sometimes the margins are marked with dark bands, with two or three dark spots in the wing and one dark spot in each back wing. They deposit their eggs singly over the leaves of their food plants. These eggs hatch in about a week and the small green worms grow rapidly, first skeletonizing the leaves and later eating out the entire leaf. The worms become full grown in about two weeks, transform to the chrysalis and later to the butterfly stage. There are a number of broods each year, probably five or six over most of the state.

Control—Spray with arsenate of lead at the rate of 1 lb. powdered to 50 gal. water when the worms are first noticed and repeat whenever they become numerous up to the time of heading. On cabbage use 1 lb. soap to each 25 gal. spray. The soap is essential to make the spray adhere to the foliage. Soap solution at the same rate and hellebore 2 oz. to 1 gal. water. Cabbage sprayed with

arsenate of lead at the above strength is perfectly safe for eating when all outer leaves are removed from head. Parasites are important in the control of this insect.

Insect—18. Colorado Potato-Beetle

Crops Attacked—Potato, tomato, eggplant, tobacco.

Character of Injury—Striped hemispherical yellow and black beetles or reddish slug-like insects eating the leaves and tender stalks of food plants.

Life History—Passes winter in adult stage hibernating under leaves and rubbish about fields and gardens. Beetles do not become active until warm days of spring, when they fly for considerable distances. They mate and the females deposit their yellow eggs in masses of 25 to 30 on the plants. Larvae hatch in about ten days and grow rapidly, feeding ravenously upon the leaves. They become full grown in 2 to 3 weeks, enter the ground, where they change to the pupal or resting stage and later emerge as full grown beetles. There are two broods each season, the adults of the last brood hibernating.

Control—Spray when beetles first appear on foliage, using arsenate of lead at 3 lb. powdered to 50 gal. water. Or Paris green at 1½ lb. to 50 gal. water. Spray again when larvae become abundant.

Insect—19. Potato Aphis

Crops Attacked—Potato, tomato, eggplant, and many other crops.

Character of Injury—Small greenish or pinkish green plant lice clustered on the undersides and about the tips of leaves. Wilting and curling of the leaves of food plants.

Life History—Passes winter in the form of a black egg on rose and probably some other plants. The eggs hatch about the time the foliage appears in the spring, the young aphids at first feeding upon the rose leaves and migrating to other food plants in May and June. During the entire summer they give birth to living young and under favorable conditions multiply with extreme rapidity. In the fall true sexes appear, which migrate back to the rose, where the winter eggs are deposited.

Control—Spray with 40% nicotine sulfate solution at rate of ½ pint to 50 gal. water or Bordeaux mixture. If used alone add 1 lb. soap to each 25 gal. water. Spray with 5% kerosene emulsion; there is some danger of burning with this solution. These sprays kill by hitting the bodies of the insects and it is necessary to apply with considerable force to make sure that the spray covers the under, as well as the upper, sides of the leaves. Parasites are important in the control of this insect.

Insect—20. Sod Web-worms

Crops Attacked—Corn, blue grass, timothy, many other crops and grasses.

Character of Injury—Cutting off of plants at or just below the surface of the ground. Flimsy webs with small bits of dirt attached around injured plants.

Life History—They pass the winter as partly grown larvae in webs just below the surface of the ground. The worms become active early in the spring and continue their growth until May 15 to June 15, when they become adults. The adult is a rather small elongated grayish brown moth. The mouth-parts project in front of the head, giving it the appearance of having a long projecting snout. The moths are frequently seen around lights and are noticeable from their habit of making short jerky flights in front of one walking in grass lands. The eggs are scattered at random in grass lands. There are from one to possibly three broods each season, depending on the species.

Control—Early fall plowing and late spring planting of grass lands. When worms are abundant in sod land, plant such land to small grains, soybeans or cowpeas. Re-plant corn, allowing first planting to stand.

Insect—21. Chinch-bug

Crops Attacked—All grasses, particularly small grains and corn.

Character of Injury—Wilting and drying up of the crops attacked. Large numbers of vile-smelling sucking insects clustered about the base of food plants.

Life History—Passes winter as adult, hibernating in trash and leaves along fence rows, hedge rows, margins of fields, and the base of bunch-forming grasses. Flies to fields of small grain in early spring and deposits its eggs around the bases of the leaves and roots. Small reddish nymphs hatch from these eggs and later become black with white markings. The nymphs become full grown a little after wheat harvest. The full grown insect, which is black and white, crawls or flies to fields of corn and deposits eggs for the second generation. Adults of this generation, which become full grown in September, go into hibernation from the first to the middle of October.

Control—Burn the bugs in their winter quarters. Use barriers at harvest time. Grow legumes and other non-grass crops on which the bugs cannot feed and multiply. Spray with 40% nicotine sulfate at rate of 1 tablespoon, 1 oz. soap, 1 gal. water, when bugs are congregated on outer rows of corn.

Insect—22. Hessian Fly

Crops Attacked—Wheat, rye, barley.

Character of Injury—Discoloring, stunting and deadening of wheat plants in the fall. Stunting of stools of wheat in the spring. Falling of straws just before harvest.

Life History—Passes winter in the form of a small brown puparium or flaxseed, usually below the surface of the ground in volunteer or early sown wheat. The adult flies emerge from these flaxseeds during March and April, fly to the leaves of wheat, on the upper sides of which they deposit their small red eggs. Maggots hatching from these eggs work down behind the boots of the leaves and in this stage do all their feeding. On becoming full grown they change to puparia or flaxseeds in which stage they pass the summer in the wheat stubble, emerging as adults early in the fall and laying their eggs on volunteer or early sown wheat. There are generally two broods and sometimes three or more.

Control—Sow wheat so it will come up after the fall brood of the fly has ceased laying eggs. Plow under all infested stubble and volunteer wheat. Fertilize to increase the resistance of the plants to the attacks of the fly. Parasites are important in the control of this insect.

Insect—23. Cutworms

Crops Attacked—Nearly all cultivated crops.

Character of Injury—Plants cut off at or just below the surface of the ground. Trees and vines defoliated.

Life History—There are a number of species of these insects. The winter is passed in different stages, depending on the species, but mostly in the larval stage. The larvae become abundant at different times of the spring, but are most numerous during the last of May or first of June. On becoming full grown all species enter the ground and change to a brown pupal stage in a small cell made in the earth, without forming a cocoon. The adults are all night-flying moths. Nearly all lay their eggs, by preference, in grass lands, about the bases of the stools, behind the boots, or in the folded leaves of grasses.

Control—Early fall plowing of sod land to be planted to corn the next season. Thoro cultivation of corn land and late planting. Use of poison bran mash as recommended for army-worm. Growing of small grains on land likely to be heavily infested. Parasites are important in the control of this insect.

Insect—24. Army-worm

Crops Attacked—Most cultivated crops, but prefer grasses.

Character of Injury—Stripping of leaves from food plants, done mostly at night.

Life History—Passes winter as a partly or nearly full grown dark green worm with several stripes down the back and sides. The worms become full grown early in the spring, change to a brown pupal stage from 2 to 4 inches below the surface of the ground, and emerge from the last of March to the first of May as fawn colored moths with a white spot in the center of each front wing, with a wing expanse of 1½ inches. The moths fly by night and deposit their eggs behind the sheaths or in the folded leaves of grasses generally selecting a rank growth. The eggs hatch in from 10 to 20 days. The young worms remain hidden about the roots and stems of grasses and feed mostly at night. They become full grown in from 3 to 4 weeks and are most destructive during the last ten days of growth. They then enter the soil and later change again to moths. There are three broods of the insect each season thruout most of this state.

Control—Use barriers made by deep dust furrows, with post hole traps in the bottoms, around fields from which the worms are traveling. Sow infested fields with poison bran bait at the rate of 8 to 10 lbs. per acre. Parasites are important in the control of this insect.

Insect—25. Grasshoppers

Crops Attacked—Wheat, corn, clover, alfalfa, soybeans, cowpeas, young orchards and many other crops.

Character of Injury—Defoliation of food plants.

Life History—All species of grasshoppers which are markedly injurious in this state pass the winter in the egg stage. Eggs hatch from the first of May to the middle of June, depending on the latitude, and the young hoppers remain well hidden for the first two or three weeks of their growth. They reach maturity in a month or six weeks when they become winged and during the last two or three weeks feed very ravenously. The adults continue to feed, mate, and begin laying eggs the latter part of August. They deposit their eggs in masses of from 25 to 50 in small holes excavated in the ground, generally in unused land such as roadsides, field margins, and ditch banks. The eggs are covered with a glutinous secretion which cements them together, waterproofs them, and makes them very difficult to find.

Control—Fall plowing of land in which the eggs have been laid. Use of poison bran bait. Hopper catchers and hopper dozers. Parasites are important in the control of this insect.

Insect—26. Northern Corn Root-Worm

Crops Attacked—Roots of corn.

Character of Injury—Irregular brown burrows in roots of corn. Corn roots eaten entirely away. Falling of corn stalks about the time the ears begin to silk.

Life History—Passes winter in the form of small grayish white eggs scattered promiscuously thru the soil about the base of corn plants. The eggs hatch from the first to middle of June into grayish white thread-like worms. The worms feed on the roots of corn, tunneling thru the root and as they become larger cutting off the small roots. They become full grown during the last of July and August, when they change to a white pupal stage and later emerge as small greenish or yellowish green beetles. These beetles feed in great numbers on fresh corn silk and on the flowers of many of the fall blooming plants, and deposit their eggs in the soil of the corn fields.

Control—Growing of any crop other than corn for one year in infested fields.

Insect—27. Corn Root-aphis

Crops Attacked—Corn, cotton, several weeds and grasses.

Character of Injury—Small bluish green lice clustered in large numbers on the roots of plants, generally attended by a small brown ant. Reddening, stunting and wilting of plants.

Life History—Passes winter in the form of dark green minute shiny eggs in the nests of the small brown corn field ant. The eggs begin hatching in the spring about the time the first smartweeds appear in the fields. The ants transfer the young root lice to the roots of smartweeds or other weeds and later to corn, if any is grown in the vicinity. During the entire summer the aphids give birth to living young which are cared for by the ants and placed upon the roots of their favorite food plants. In the fall true sexes appear, eggs are laid, which are gathered up by the ants and stored in their nests during the winter. The honey dew secreted by the aphids is the chief food of the corn field ant.

Control—Break up the ants' nests by 6½ to 7 inch spring plowing followed by two or three double diskings of infested fields before being planted to corn. Diskings to be given at not more than three day intervals. Treat seed with some substance repellent to ants.

Insect—28. Wheat Joint-Worm

Crops Attacked—Wheat.

Character of Injury—Breaking over of the straw when heads begin to fill. Hard knot-like galls from 1 to 12 in number formed in the straw just above the first or second joint.

Life History—Passes winter as a larva inside the galls in the standing stubble in the wheat fields or in the cut straw. The small, black, winged, wasp-like adults begin emerging in the spring about the time the wheat begins to shoot. They deposit their eggs inside the wheat straw generally just above the first or second joint. A number of eggs are usually laid in each place. The eggs hatch into small yellowish maggot-like larvae which feed on the inside of the straw, causing formation of the hard knotty galls. They reach the full grown stage just before wheat harvest and remain in the galls until the following spring.

Control—Plow under infested stubble fields to a depth of at least six inches during late summer or fall. Sell infested straw for use in cities. Burn off standing infested stubble during late fall or early spring. Parasites are important in the control of this insect.

Insect—29. Corn Flea-Beetles

Crops Attacked—Corn and minor injuries to a few other grass crops.

Character of Injury—Very small black shiny beetles skeletonizing leaves of corn.

Life History—Passes winter in the adult stage hibernating in various shelters afforded by leaves and trash. The beetles become active in the spring when the temperatures for several days reach 60 to 70. They feed on the leaves of a number of weeds and wild grasses. In cold backward seasons they will often congregate in large numbers on corn and where the plant is not growing rapidly will so skeletonize the leaves that the plants will die. During seasons which are favorable for the growth of corn almost no injury from this insect occurs.

Control—Destroy by burning in hibernating quarters. Late planting of corn with thoro cultivation of ground before planting.

Insect—30. Wireworms

Crops Attacked—Nearly all cultivated crops.

Character of Injury — Sudden dying or wilting of infested plants. Failure of corn seed to germinate. Bright shiny hard worms feeding on roots of plants, or seeds in the ground.

Life History—There are several species of wireworms which are injurious. Most of these pass the winter either in the larval or pupal stage in the soil. The larvae are shiny brown worms

from 1/3 to 1¼ inches in length, varying in species. On becoming full grown they form small cells in the earth in which they change to the resting or pupal stage, and later emerge as elongated brownish or blackish click-beetles, which when turned upon their backs will throw themselves in the air by a quick movement of the head and thorax. The eggs are deposited in grass lands. Most severe injury generally occurs the second year after breaking up sod. Different species complete their development in from two to five years.

Control—No satisfactory measures of controlling these insects are known. Thoro heavy cultivation before planting and in most cases fall plowing will tend to minimize the injury. Plant small grains on second year sod.

Insect—31. Corn Ear-worm

Crops Attacked—Corn, tomato, potato, tobacco. Minor injuries to several other crops.

Character of Injury—Large striped worms feeding about the silk and in the ends of the ears of corn. Burrowing in tomatoes. Feeding on the foliage of other crops.

Life History—Passes winter in the brown pupal or resting stage in a small cell formed from 2 to 4 inches below the surface of the ground. The moths begin emerging from these pupae in May and June. They have a wing expanse of about one inch. The fore wings are buff to yellow with irregular patches of gray. They fly at night and deposit their eggs on the various food plants. The first generation feeds mainly upon the leaves of various crops, including corn, and on becoming full grown enter the ground, pupate, and produce another brood of moths. There are three broods of this insect thruout the greater part of this state. The moths of the last generation lay their eggs principally on the fresh silks of corn and the larvae of this brood cause by far the greatest amount of injury.

Control—No satisfactory means of control has been developed. General fall plowing of infested corn fields would greatly lessen the injury. Early maturing varieties of corn. Early planting.

Insect—32. White-grubs

Crops Attacked—Corn, small grains, and nearly all cultivated crops except clover and alfalfa.

Character of Injury—Dying of pasture and grass lands. Corn with roots eaten off by large fleshy grubs. Large holes eaten in potatoes and root crops.

Life History—Pass winter in the larval or grub stage below the frost line or as adult beetles in cells in the earth within 4 to 8 inches of the surface of the ground. The adults, which are the well known June beetles, appear from the middle of April to middle of June. They remain in the ground during the day and at dusk of evening fly to the foliage of various trees on which they feed during the night. The eggs are deposited in the ground mainly in grass land, sometimes in fields of small grain, almost never in clover or alfalfa. The eggs hatch in about three weeks and the young grubs take from 2 to 3 years to reach maturity, feeding during the summer on the roots of their food plants and going below the frost line on the approach of cold weather in the fall.

Control—Pasture heavily infested land with hogs. Plant corn on corn ground or clover or alfalfa sod in year following heavy flights of beetles. Early fall plowing in years of beetle abundance.

Insect—33. Clover-Seed Midge

Crops Attacked—Red, alsike and mammoth clover.

Character of Injury—Mis-shapen heads one side of which remain green. Shriveled imperfect seeds in the heads.

Life History—Passes winter either as a full grown pinkish larva just below the surface of the soil, or as a pupa. The adults, which are very small pink bodied midges at the time the clover begins heading in the spring, attach their eggs to the hairs in the head of the clover plant. The young larvae work their way into

the flowers and feed by sucking the soft newly formed seeds. On becoming full grown they drop to the ground and make tough silken cocoons in which they pupate. This generally occurs during June. In about three weeks the second brood of midges appears and lays its eggs in the newly forming heads of the second crop of clover. The larvae from these eggs form the hibernating brood of the next winter.

Control—Clip first crop of clover before any of the heads begin to wither or turn brown to destroy the seed-infesting insects before they become full grown. Sometimes a second clipping is necessary to bring the clover into bloom at a time when insects which fertilize the seed are abundant.

Insect—34. Clover-Seed Chalcid

Crops Attacked—Crimson and red clover, alfalfa and probably alsike and mammoth clover.

Character of Injury—Seeds hollowed out leaving only the outer shell. Dull brown undersized seeds.

Life History—Passes winter as a full grown larva inside the seed on the surface of the ground in clover fields. The adults begin emerging from the middle of May thru June, the females laying their eggs in the newly formed seeds, the young maggot-like larvae feeding upon the seed substance and entirely consuming it. They pupate within the seed and eggs for second brood are laid during August, the larvae of this brood forming the over-wintering generation.

Control—Same as for clover-seed midge. Do not allow clover to stand over a second year. Parasites are important in the control of this insect.

Insect—35. Stored Grain Insects

Crops Attacked—Stored grains and seeds and grain products.

Character of Injury—Heating and matting together of the grain. Small worms, or reddish or blackish beetles, eating holes in the sides of the kernels. Small grayish moths flying about over the bins and crawling over the grain.

Life History—There are a number of species of grain-infesting insects which are common in this state, all of which are controlled by the same methods. The most common are the Angoumois grain-moth, Mediterranean flour-moth, Indian meal-moth, confused flour-beetle, rough-necked flour-beetle, grain and rice weevil, and the dark meal-worm. These insects all infest grain stored in bins and breed thruout the year when temperatures are above 50° F. Both adults and larvae of the beetles and weevils feed upon the grain; only the larvae of the moths are destructive.

Control—Thoroly clean and sterilize the grain bins when they are empty. If bins are infested fumigate when empty with hydrocyanic acid gas. Bins filled with grain may be fumigated with carbon bisulphid. Heat buildings in which grain is stored to a temperature of 130 to 140° F., maintaining this temperature for at least four hours.

Insect—36. Pea and Bean Weevil

Crops Attacked—Stored beans, peas, cowpeas, and soybeans.

Character of Injury—Grayish snout beetles or whitish grubs eating out the inside of beans and peas.

Life History—Passes winter in the adult or immature stage, depending on the temperature at which the seed is held. Where beans or peas are stored at temperatures above 50° F., the insects will breed thruout the season. During the summer eggs are laid in the pod of beans or peas in the field and the young larvae which have just entered the seed are carried to the storage bins with it.

Control—Heat and fumigate as for stored grain insects. If to be used as seed, do not heat above 135° F. Considerable degree of protection can be afforded by mixing the seed with air slaked lime at the rate of one part of lime to four parts beans or peas. This should be done as soon as the beans or peas are threshed.

Insect—37. Tussock-moth

Crops Attacked—Nearly all deciduous trees and many shrubs.

Character of Injury—Leaves skeletonized or trees entirely defoliated.

Life History—Passes winter in the form of a white frothy appearing egg mass attached to the trunks or larger branches of trees, or occasionally to dead leaves fastened to the trees. Eggs hatch shortly after the trees come out in leaf. The young caterpillars at first skeletonize the leaves, eating out the green part, and later eat the entire leaf except the veins. They spin thin silken cocoons, the males emerging as dark brown moths with lighter brown spots upon the wings, and are strong fliers. The females are nearly wingless, are unable to fly, and mate and frequently deposit their eggs on the outside of their cocoons. There are two broods of the insect each season, the worms of the second brood appearing in August and September.

Control—Apply creosote to the egg masses on the trees with a brush attached to a long pole. Spray trees when the worms are first noticed on the foliage with arsenate of lead at rate of 1½ lb. powdered to 50 gal. water. Parasites are important in the control of this insect.

Insect—38. Bronze Birch Borer

Crops Attacked—Birch.

Character of Injury—Dying tips of branches of trees. Small irregular burrows running thru the inner bark, packed with frass and sawdust.

Life History—Passes winter in the larval or grub stage in its burrows in the trees. It changes to the pupal or resting stage early in the spring, and emerges during May and June as a small grayish bronze beetle. The female beetles deposit their eggs in the cracks and crevices of the bark during June and July. The young grubs hatching from these eggs bore thru the inner bark of the trunk and larger branches and where numerous often girdle the tree. There is one generation each year.

Control—Cut and burn all parts of infested trees between October first and April first.

Insect—39. Handmaid Moth

Crops Attacked—Hickory, pecan, walnut, English walnut.

Character of Injury—Large colonies of caterpillars clustered on leaves entirely defoliating the branches and trees.

Life History—Passes winter in the pupal or resting stage from 4 to 6 inches below the surface of the ground. Changes to the adult stage or moth during the latter part of June and July. The moth has a wing expanse of about 1½ inches, is light brown with a very dark brown patch between the wings. The moths fly for considerable distances to the trees on which the larvae feed, where they lay their eggs on the small twigs and stems of the leaves. The young caterpillars on hatching feed together and as they molt or change their skins, will frequently crawl down on the trunk of the tree, sometimes collecting in masses from 3 to 6 inches in diameter. On becoming full grown they crawl down the trunk and some distance away from the tree, enter the ground and change to the pupal stage, there being one generation each season.

Control—Spray trees with arsenate of lead 2 lbs. powdered to 50 gal. water. Crush or burn the masses of caterpillars when they come down the trunk to change their skins.

Insect—40. Bagworm

Crops Attacked—Nearly all deciduous and evergreen trees and shrubs.

Character of Injury—Defoliation of trees.

Life History—Passes winter in the egg stage, the eggs being laid in a small sac or bag which is attached to the twigs or branches of the tree. The eggs hatch the latter part of May and during June. The young worms at once enclose themselves in a silken sac, to which they attach the stems of the leaves on which they feed, en-

larging the sac as they grow, until when they are full grown the latter part of July the sac is from 2½ to 3 inches long. They then change inside the sac to the pupal stage. The males emerge as strong flying insects. The female never leaves the sac, but mates and lays her eggs inside the sac, dying shortly afterwards.

Control—Spray trees shortly after the worms hatch with arsenate of lead at 3 lbs. powdered to 50 gal. water. On small trees hand-picking and burning of the bags during the winter. Parasites are important in the control of this insect.

Insect—41. Cottony Maple Scale

Crops Attacked—Soft maples, linden, Norway maple, occasionally poplar and hard maple.

Character of Injury—Cottony masses covering undersides of the twigs and branches during May and June.

Life History—Passes winter in the form of living, partly grown, female scales attached to twigs and branches. About the time the leaves appear on the trees the scale begins to grow very rapidly and deposits a large number of eggs which are secreted in a cottony mass of wax which entirely covers its body. These eggs hatch in June and July, the young scale crawl out upon the leaves where they feed along the veins or on the new growth of the season. At the approach of cold weather they return to the twigs, mate, and the males die, the females living thru the winter.

Control—Spray with miscible oils early in the spring just before the buds appear. Parasites are important in the control of this insect.

Insect—42. Sheep Bot

Attacked—Sheep.

Character of Injury—Copious discharge of mucus from the nose. Bleeding from nose. Lack of energy on part of sheep.

Life History—Passes winter in the form of a maggot or larva living in the upper nasal passages in the head of the sheep. Occasionally the maggots penetrate the brain, when death always follows. They become full grown in April and May, work out of the nose and drop to the ground, where they pupate, emerging as flies during June and July. The flies lay their eggs on the nostrils of the sheep and the young maggots on hatching work back into the nasal passages.

Control—Rotation of pastures. Drenching nostrils with solutions of lysol. Inducing forcible sneezing to rid nostrils of maggots.

Insect—43. Biting Stable Fly

Attacked—Men and all domestic animals.

Life History—Probably passes winter as a pupa or adult. Adult flies appear early in the spring and lay their eggs in manure or the bases of old straw stacks and occasionally in garbage. The eggs are laid in masses of 75 to 100. About 18 to 40 days are required for the development of each generation, a number of generations being produced during the summer. This fly is the most common biting fly occurring around barns and stables and is a known carrier of some diseases.

Control—Remove and spread manure and straw from stables and barns. Powdered borax sifted over manure at the rate of 11 oz. to 8 bu. manure.

Insect—44. Lice on Chickens

Dust lightly with sodium fluoride. Keep premises clean.

Insect—45. Mites in Poultry Houses

Spray thoroly with lime sulfur mixture as used for San Jose scale. Dip poultry in a solution of this mixture used at strength of dormant spray for trees. Dust nests with finely powdered sulfur.

COMMON DISEASES OF FRUITS AND VEGETABLES

FRUIT DISEASES

Apple

Scab—Olive green to blackish velvety spots 1/8 to 3/8 inches in diameter appear on the fruit and foliage. First appearance on leaves about the middle of May. Winters on old leaves under trees. Controlled by spraying.

Blotch—Black, tar-like spots often with fringed edges appear on the fruit. The cankers appear on the 1 to 4 year old twigs. Produces minute spots on the leaves late in the season. Winters in the cankers on the twigs. Controlled by spraying.

Blight—(See Pear).

Bitter Rot—Causes rotting of the fruit. Rotted spots usually several on a fruit. Circular, sunken, finally with pink cushions near the center. Distinguished from other rots by the fact that it does not necessarily center about an injury but attacks the healthy uninjured fruit. Appears July or August. Winters in old wounds and cankers on the limbs and on the mummied fruit. Controlled by spraying.

Rust—Orange colored spots 1/4 to 3/8 inches appear the latter part of May or the first of June on foliage and occasionally on fruit later in the season. On lower surfaces of leaves cup-shaped fruiting bodies may be observed. Does not kill tissue of the leaf. Winters on cedar trees as cedar apples. Controlled by cutting out cedars in the neighborhood of the orchard.

Blister Canker—Also called nail head and Illinois apple tree canker. Causes cankers on large limbs and trunks of trees, finally girdling and killing limbs. Bark mottled beneath surface at edge of cankers. Nail heads or stud-like bodies near centers of old cankers. When cut across, black, circular rings appear where nail heads were observed on the surface. Most common on Ben Davis. Controlled by keeping cankers out of orchards and by avoiding the use of susceptible varieties in planting.

Crown Gall—(See Raspberry).

Pear

Blight—Blossoms, spurs, and young twigs wilt and turn black early in the season. Large, sunken, smooth cankers are produced on large limbs and body. Not controlled by spraying.

Scab—(See Apple). Different from apple scab in that the twigs are occasionally attacked and frequently the fungus lives on the twigs.

Bitter Rot—(See Apple).

Crown Gall—(See Raspberry).

Rust—(See Apple).

Quince

Blight—(See Pear).

Leaf Blight or Spot—Brown, circular spots about ¼ inch in diameter with black dot in center appear on foliage and fruit in July. Winters on leaves under trees. Controlled by spraying.

Bitter Rot—(See Apple).

Peach

Brown Rot—Affects blossoms, twigs and fruit. Brown, circular rotted spots appear on fruit when half grown or later. Develops rapidly, rotting the entire fruit in a few days. Rotted areas covered with small, ash-gray cushions when fruit is kept moist. Most destructive when fruit is ripening or in transit. Winters on mummied fruits or in cankers on limbs. Blights blossoms and twigs. Controlled by spraying.

Leaf Curl—Affects leaves and twigs. Leaves curl and wrinkle. Pink or reddish over affected surface. Appears in May or early in June. Controlled by spraying.

Scab—Small, brown or olive-green spots resembling freckles appear on upper surface of fruit when half grown or older. May cause cracking when serious. Controlled by spraying.

Bacterial Shot-Hole—Circular spots ⅛ to ¼ inches in diameter appear on the leaves. These later drop out producing shot-hole effect. Defoliation in severe cases. On fruit similar spots appear with numerous superficial cracks running from spot to spot. Inconspicuous cankers are produced on the twigs. Controlled by applications of nitrogenous fertilizers and good cultivation and care of orchard.

Crown Gall—(See Raspberry).

Plum

Brown Rot—(See Peach).

Black Knot—Causes black, enlarged, rough swellings on twigs and smaller limbs. Swellings extend three or four inches along twigs and frequently 10 or 20 times the size of the twigs. Especially severe on blue plum varieties. Controlled by cutting out and destroying knots.

Leaf-Spot—(See Cherry). Differs from cherry leaf-spot in that shot-hole effect is produced and usually no yellowing of leaves.

Crown Gall—(See Raspberry).

Bacterial Shot-Hole—(See Peach).

Cherry

Brown Rot—(See Peach).

Leaf Spot—Also called leaf blight and yellow-leaf. Small brownish spots appear on the leaves during June or July. Often white coating of spores on under side of spot. Leaves turn yellow in case of sour cherries and bronze colored in case of sweet cherries. Leaves drop. Fungus winters on fallen leaves under tree. Controlled by spraying.

Powdery Mildew—Leaf rolls inward exposing under surface. Whitish mildew growth on under surface of leaf. Defoliation sometimes results. Controlled by spraying.

Raspberry and Blackberry

Crown Gall—At surface of ground or on large roots, rough, globular swellings about the size of a pea to the size of a baseball appear. This disease is common on all kinds of fruits and many vegetables. The size and character of the galls vary somewhat according to the kind of fruits. Galls usually distinguished from natural swellings by the rough surface. Not controlled by spraying or application of chemicals to soil. Disease germs (bacteria) remain in the soil from year to year.

Anthracnose—Appears as circular or oval lesions ¼ to ½ inch in diameter on stems, especially near surface of ground. When numerous, causes splitting of bark. Most common on black caps. Controlled by spraying and proper planting of new patch.

Orange Rust—Most common on blackberries. Brilliant orange colored, dusty masses on lower surface of leaves. Appears in May. Rare on raspberry. Not controlled by spraying. Digging up diseased bushes and growing resistant varieties, such as Snyder, only methods of control.

Leaf Spot—Small, gray to brownish-red, spots, usually numerous, appear on the leaves during June. May cause defoliation. Controlled by spraying.

Strawberries

Common Leaf Spot—Purple bordered circular spots ⅛ to ¼ inches in diameter appear on the new leaves in June and persist on the old leaves thruout the season. Controlled by spraying but usually not severe enough to warrant spraying.

Leaf Blight—Spots larger than in the common leaf spot, frequently fan-shaped, extending from the midrib to the edge of the leaf. No control known.

Gray Mold—Appears on the fruit in the field or in transit as a brownish rot. Berries remain solid but tough and insipid to taste. Grayish mold appears on the fruit when damp. Partly controlled by good cultural methods.

Soft Rot or Leak—Berries when ripe become very soft and mushy. When shipped, juice runs out and stains boxes. Rotten berries very disagreeable tasting and become covered with black mold. Disease caused by common bread mold. Careful picking and placing on market in shortest possible time only method of control.

Gooseberries and Currants

Leaf Spots—Several distinct leaf spots appear on gooseberries and currants. These cannot be distinguished from each other except by an expert. Controlled by spraying but advisability of spraying questionable.

Gooseberry Mildew—European varieties of gooseberries commonly mildew in this state. This is a surface or powdery mildew appearing on the leaves and fruit. Controlled by spraying or dusting.

Cane Blight—Entire bushes or several canes in a bush die as a result of this disease. Brick-red, small,

hemispherical masses appear over the surfaces of the dead canes. This fungus is not the cause of the disease but it usually follows the dying of the canes and is one of the surest ways of diagnosing the trouble. Not controlled by spraying.

Grapes

Black Rot—Appears as brown, dead, circular spots about ¼ inch in diameter on leaves. Numerous black dots on the dead central area. Causes rotting and wrinkling of the berries. Winters on the mummied fruits on ground and on vines. Controlled by spraying.

Downy Mildew—Scattered downy areas appear on the lower surfaces of the leaves with corresponding yellow spots evident on the upper surface. Also downy growth on the young shoots. Causes rotting of the fruit. Controlled by spraying.

Powdery Mildew—Large areas or entire leaf surfaces become covered with a fine, grayish-white mildew. The shoots and berries may also become covered with this cobwebby growth. Controlled by spraying.

Anthracnose—Small cankers are produced on the shoots and tendrils. The lesions are brown, slightly depressed in the center and raised at the border. Cankers become elongated in the direction of the main axis of the shoot. On the berries, spots resembling birds' eyes are produced. Berries finally wither and dry up. Controlled by spraying.

Crown Gall—(See Raspberry).

Ripe Rot—Appears on ripe grapes only. Diseased flesh becomes reddish-brown or rosy in color. Surface is sunken. Entire berries rot and easily drop from stem.

Dead Arm—In mid-summer, entire branches or shoots show yellow, dwarfed, curled leaves. Branches may not die until following season. When on shoots, reddish-brown or black spots are produced, often showing longitudinal splitting of the bark.

VEGETABLE DISEASES

Asparagus

Rust—Small, rust colored spots on all parts of top. These later become black. Control: Use rust resistant varieties.

Bean

Anthracnose — Reddish-brown, circular or elliptical, sunken spots appear on stems, leaf veins and pods. Often pink cushions of spores appear near center of spot. Control: Select seed from disease-free pods. Do not cultivate when plants are wet. Anthracnose resistant strains of some standard varieties are on the market.

Rust—Small, brown masses of spores appear on under surface of leaf. Control: Not regarded as serious enough to warrant control measures.

Blight—Causes large, papery, dead spots on leaf and watery spots on pod. Sometimes causes blighting of entire plant. Control: Select seed from disease free plants.

Beet

Leaf Spot—Numerous gray spots with dark border occur on leaves. Control: Spray with Bordeaux 4-4-50 at frequent intervals. Crop rotation is essential.

Scab—Scabby patches on roots resembling potato scab which is caused by the same organism. Control: Crop rotation. Do not plant beets following potatoes.

Crown Gall—Large, warty galls on roots. Control: Crop rotation.

Cabbage

Club Root—Large finger-like swellings on roots. Top does not head and assumes yellowish color. Control: Examine seedlings before they are put in field and destroy all that show swollen roots. Lime soil thoroly several months before growing cabbage. Rotate crops and keep down weeds.

Black Rot—Dead spots at edges of leaves appear followed by blackening of veins. Leaves drop off. Black ring observed when stem is cut across. Con-

trol: Disinfect seed with formaldehyde (¼ pint to 7 gallons water). Avoid use of manure having cabbage refuse. Crop rotation.

Yellows—Seedlings are yellowish and stunted. In field, plants are stunted and outer leaves turn yellow and drop off. Control: This is a soil disease. Resistant strains of standard varieties have been developed and the seed may be obtained. Crop rotation and disinfection of seed is not effective.

Cantaloupe

Anthracnose—Causes dead spots on leaves and brown, sunken spots on stems and fruit. Control: Spray with Bordeaux mixture 2-4-50 at frequent intervals. Rotate crops.

Leaf Blight—Leaf spots large, dry, brown, with concentric zones of light and dark brown. Control: Spray as for anthracnose. Use resistant strains.

Soft Rot—Fruit rots on vine. Usually due to bacteria. Control: None known. Turning melons and avoiding injury aids.

Wilt—(See Cucumber).

Cauliflower

(See Cabbage).

Celery

Early Leaf Blight—Causes spotting and drying of leaves early in the summer. Starts in seed bed and is favored by hot weather. Control: Spray with Bordeaux mixture 3-6-50. First application in seed bed. Spray in field every three or four weeks if weather is hot.

Late Leaf Blight—Produces irregular spots, usually on outer leaves first. If spots are numerous, the leaves blight; numerous small, black dots may be observed on dead areas. Control: Same as for Early Blight.

Cucumber

Wilt—Caused by bacteria which fill the sap tubes of the plant causing wilting of entire vine. Commonly carried in the field by insects and in the greenhouse by insects and workmen. Control: Avoid handling plants whenever possible. Control beetle. Destroy diseased plants as soon as they show signs of wilting.

Lettuce

Downy Mildew—Usually appears in greenhouse only. Light colored spots on upper surface of leaf and fine mildew on under surface. Control: Destroy infected plants as soon as they appear. Water by subirrigation, keeping leaves dry.

Drop—Lower leaves first drop, followed by wilting of entire plant. Base of leaves and stem rolled. Control: Steam sterilization of soil in greenhouse. Crop rotation and destroying diseased plants should be practiced in field. Ground where diseased plants are removed should be drenched with solution of copper sulfate (1 pound in 7 gallons water).

Onion

Black Spot—Mainly affecting onion sets. Black spots under outer scales causing rotting in storage. Control: Rapid artificial drying in properly constructed house most effective.

Smut—Mainly on seedlings. Dark spots appear on seedling leaves followed by longitudinal cracking exposing black powdery mass of spores. Infected seedlings die early. Control: Use formaldehyde drip apparatus on seed drill (1 pint formaldehyde to 16 gallons of water at the rate of 200 gallons per acre).

Pumpkin

(See Cantaloupe).

Radish

(See Cabbage).

Sweet Potato

Black Rot—Sprouts dwarfed and yellow with black shank. In field plants frequently wilt and die. Irregular dark areas from ½ to 2 inches in diameter occur on the potato. Control: Discard and destroy diseased seed (roots). Disinfect seed with a solution of 1 ounce mercuric chloride in 8 gallons of water. (Soak for 8 or 10 minutes, then dry.) Use new soil each year in seed bed or steam sterilize old soil.

Soft Rot—Roots show soft, slimy rot in storage. Neighboring roots in bin often show wetting of surface. Marked odor in bins when rot is serious. Control: Careful harvesting to avoid scratching or injury to roots. Dry rapidly in bins with artificial heat and good ventilation.

Other Rots—There are numerous rots of sweet potato roots caused by many kinds of fungi. Control: Control measures are as for Soft Rot.

Tomato

Blossom End Rot—Circular, sunken, black area at blossom end. Caused by excessive fertilization and dry conditions. Control: In greenhouse keep plants well watered. In field avoid over fertilizing with nitrogenous fertilizers.

Leaf Spot—Causes small, usually numerous dead spots on leaves with black dots on the dead central area. Defoliation results in severe attacks. Control: Spray with Bordeaux mixture 4-4-50 or copper soap (copper sulfate 5 pounds, resin-fishoil soap 3 pounds, water 50 gallons).

Wilt—Leaves droop and finally whole plant wilts. Black fibrovascular bundles characterize the disease. Control: This is a soil disease and can best be controlled by securing wilt-resistant strains.

Watermelon

Anthracnose—Dead, sunken spots on fruit on which pink spore masses often develop. Control: See Cantaloupe.

Spray Schedule for Apples

Time to Spray	What to Spray For	Material to Use
1. When trees are dormant.	Scale insects.	Lime sulfur solution, 5½ gallons in 50 gallons of water.
2. When buds are showing pink but before any flowers have opened.	Scab, curculio, canker-worm, bud moth.	Lime sulfur solution 1 gallon, dry lead arsenate, 1 lb.; water, 50 gallons. 4 lbs. of dry lime sulfur may be substituted for 1 gallon of lime sulfur solution.
3. When ¾ of the petals have fallen.	Codling moth, scab, curculio, bud moth, canker-worm, green apple worm.	Same as 2.
4. To be completed 10 days after petals fall; Northern section. If weather is cool and wet; Southern section.	Scab, codling moth and curculio.	Same as 2.
5. To be completed 3 weeks after petals fall.	Apple blotch, codling moth, curculio, sooty blotch, fly speck, and leaf spot.	Same as 2.
6. Five weeks after petals fall; Southern section.	Apple blotch.	Same as 2. If temperature is above 90° F., Bordeaux should replace lime sulfur, in which case the lead arsenate may be omitted.
7. Seven weeks after petals fall; Southern section.	Apple blotch.	Same as 6.
8. 10-12 weeks after petals fall.	Codling moth.	Dry lead arsenate, 1 lb.; freshly slaked lump lime, 2 lbs.; water, 50 gallons.

ADDITIONAL SPRAYS: Additional sprays are chiefly used as preventive against bitter rot. Where this disease is anticipated, spraying should begin the first week in July, and should be followed at intervals of ten days until four applications have been made. Bordeaux (3 lbs. of copper sulfate and 4 lbs. of slaked lime in 50 gallons of spray) is the proper fungicide to use for this disease. If no preventive sprays have been applied, and the disease appears suddenly and unexpectedly, spraying should be commenced without a moment's delay. On late varieties of apples a repetition of 8 will be necessary where season is hot and dry as a preventive of codling moth. This will apply only to the central and southern sections and will usually come about 18 or 19 weeks after 3.

Spray Schedule for Peaches

Time to Spray	What to Spray For	Material to Use
1. When trees are dormant.	Scale insects and leaf curl. Peach twig borer.	Lime sulfur solution 5½ gallons in 50 gallons of water.
2. When shucks are pushed off, usually about 10 days after petals fall.	Curculio.	Dry lead arsenate, 1 lb.; freshly slaked lump lime, 2 lbs.; water, 50 gallons.
3. Three weeks after 2.	Brown rot, peach scab, and curculio.	8-8-50 self boiled lime and sulfur with dry lead arsenate, 1 lb.
4. One month before ripening.	Brown rot.	8-8-50 self boiled lime and sulfur without lead arsenate.

Spray Schedule for Cherries and Plums

Time to Spray	What to Spray For	Material to Use
1. When trees are dormant.	Spray plums for San Jose scale. Sour cherries are rarely infested and this spray may be omitted.	Lime sulfur solution 5½ gallons in 50 gallons of water.
2. Just before the flower buds open.	Leaf diseases, brown rot and curculio.	Lime sulfur solution 1 gallon. Dry lead arsenate, 1 lb.; water, 50 gallons.
3. Immediately after petals fall.	Same as 2.	Same as 2.
4. Two weeks after 3.	Same as 2.	Same as 2.

Spray Schedule for Grapes

Time to Spray	What to Spray For	Material to Use
1. After leaves have opened but before bloom appears.	Black rot, flea beetle.	Bordeaux 4-4-50 with dry lead arsenate, 2 lbs to 50.
2. After the bloom falls.	* Black rot, downy mildew, grape berry moth, curculio, anthracnose, flea beetle.	Same as 1*.
3. Two weeks after 2.	Same as 2.	Same as 1*.
4. Just before the fruit colors.	Second brood of grape berry moth.	Same as 1.

* If the grape root worm is expected, use lead arsenate at double the strength recommended.

Spray Schedule for Currants and Gooseberries

Time to Spray	What to Spray For	Material to Use
1. When plants are dormant.	San Jose scale.	Lime sulfur solution 5½ gallons in 50 gallons of water.
2. When leaves are unfolding.	Aphis, anthracnose, leaf spot.	Bordeaux 4-4-50 with nicotine sulfate 1:800 if aphis are present.
3. As soon as fruit sets.	Currant worm, cane wilt, anthracnose, and leaf spot.	Bordeaux 4-4-50 with dry lead arsenate 1 lb. to 50.

NOTE: If the currant worm appears at any time during the season, spray with lead arsenate 1 lb. and water 50 gallons.

Spray Schedule for Black and Purple Raspberries*

Time to Spray	What to Spray For	Material to Use
1. In spring before growth starts.	Anthracnose.	Lime sulfur, 2½ gallons; water, 50 gallons.
2. When new shoots are 6 to 8 in. high.	Same as No. 1.	Lime sulfur, 1¼ gallons; water, 50 gallons.
3. Just before blossoming period.	Same as No. 1.	Same as No. 2.

* Mich. Spec. Bul. 88.

MAKING SPRAY MATERIALS

Bordeaux
3 lbs. Copper Sulfate
4 lbs. Lime
50 gal. Water

Dissolve 3 lbs. of Copper Sulfate in water and dilute such solution to 25 gal.

Slake 4 lbs. of Lump Lime—being careful not to burn or drown it—and dilute to 25 gal.

Pour these solutions simultaneously into a third container making 50 gal. of Bordeaux Mixture. This mixture is now ready for use without dilution.

Lime Sulfur
50 lbs. Lime
100 lbs. Sulfur
66 gal. Water

Place 50 lbs. Lump Lime in kettle capable of holding from 66 to 70 gal. of solution. Pour into the kettle containing the Lime, about 15 gal. water —enough to start the lime slaking.

When lime is slaking vigorously add 100 lbs. of Powdered Sulfur, mixing thoroly with the Lime by stirring and add sufficient water to prevent the lime burning or "caking."

As soon as the Lime is thru slaking and the Sulfur thoroly mixed in, add water enough to make a total volume of 66 gal.

Boil, adding water from time to time to keep the volume up to 66 gal. or more, and stir thoroly thruout the boiling which should be kept up until practically all the Sulfur is dissolved. Actual boiling will require from 30 to 45 minutes.

This makes the homemade concentrated solution which is diluted 1:4 for dormant spraying and 1:20 for summer spraying.

Dilution Table for Concentrated Lime Sulfur Solutions

Degrees Baumé	Specific Gravity	Gallons of Solution in 100 Gallons for Dormant Sprays	Gallons of Solution in 100 Gallons for Summer Sprays
20	1.160	19.0	3.5
21	1.169	18.1	3.3
22	1.179	17.3	3.1
23	1.188	16.0	2.9
24	1.198	15.3	2.8
25	1.208	14.8	2.7
26	1.218	14.2	2.6
27	1.229	13.3	2.5
28	1.239	12.8	2.4
29	1.250	12.5	2.3
30	1.261	11.7	2.2
31	1.272	11.4	2.1
32	1.283	11.1	2.0
33	1.295	10.5	1.9
34	1.306	10.	1.8

Self-Boiled Lime Sulfur
8 lbs. Lime
8 lbs. Sulfur
50 gal. Water

Place 8 lbs. Lump Lime in barrel and add enough water to almost cover it. When the Lime begins to slake, add 8 lbs. Powdered Sulfur and stir constantly adding water enough to prevent the forming of orange streaks. As soon as the Lime is slaked add water enough to make a total of 50 gallons.

Hellebore
1 oz. White Hellebore
3 gal. Water

Mix 1 oz. Hellebore with a small quantity of water and strain the mixture into the spray tank containing 3 gal. water. Agitate thoroly and spray.

Paris Green
4 oz. Paris Green
1 lb. Lime
50 gal. Water

Slake 1 lb. Lump Lime with a small quantity of water. When completely slaked add sufficient water to make a milky paste.

Add to this paste 4 oz. Paris Green which has also been worked into a paste by adding a small quantity of water.

Strain into spray tank with water sufficient to give a total volume of 50 gal. mixture.

Age at Which Plants Should Be Set and Planting Distances

	Years	Feet
Apples	2	30 to 40
Apples (dwarf)	2	8 to 10
Pears	2	20 to 30
Plums	2	16 to 20
Peaches	1	20 to 25
Cherries	1	20 to 25
Apricots	1	20 to 25
Quinces	2–3	8 to 14
Grapes	1–2	8 to 12
Currants	1–2	4 x 6
Gooseberries	1–2	4 x 6
Raspberries (black)	1	4 x 6
Raspberries (red)	1	3 x 6
Blackberries	1	3 x 8
Strawberries (new plants only)		1½ x 4

Number of plants per acre $= \frac{43560}{D \times D}$ (D=distance in feet between plants.)

Varieties of Fruits for Northern Illinois

Apples

Summer Varieties — Red Astrachan, Oldenburg (Duchess), Yellow Transparent, Sweet Bough.

Fall Varieties—Wealthy, Fameuse (Snow), Ramsdell Sweet, Dyer, McIntosh.

Early Winter—Jonathan, Grimes (Grimes Golden), Delicious, King David.

Late Winter—Minkler, Salome, Willow, Northwestern (Northwestern Greening).

Pears

Standard—Flemish Beauty and Lincoln for early; Kieffer and Lawrence for late.

Dwarf—Howell for early, Duchess for late.

Peaches

Early Wheeler, Alexander, Elberta, Champion.

Cherries
Early Richmond, Montmorency.

Plums
DeSoto, Wyant, Burbank, Pomona, Surprise.

Blackberries
Mersereau, Snyder.

Raspberries
Red—King, Cuthbert, Herbert. Black—Cumberland, Plum Farmer. Purple—Columbian.

Grapes
White—Moore's Diamond. Red—Brighton. Black—Concord, Worden, Moore's Early.

Gooseberries
Downing, Chautauqua, Oregon Champion, Industry.

Currants
White Grape, Fay's Prolific, Perfection, Lee's Prolific.

Strawberries
(Perfect) Aroma, Dunlap, Dr. Burrill; (Imperfect) Warfield, Sample.

Vareties of Fruits for Central Illinois

Apples

For Family Orchard:

Summer—Yellow Transparent, Benoni, Oldenburg (Duchess), Early Harvest, Golden Sweet, Red June.

Fall—McIntosh, Maiden Blush, Ramsdell Sweet, Wealthy.

Early Winter—Grimes (Grimes Golden), Jonathan, Delicious, Stayman Winesap, King David.

Late Winter—Minkler, Ralls, Salome, Willow (Willow Twig), Winesap.

For Commercial Orchards:

Summer—Duchess, Yellow Transparent, Benoni, Chenango.

Fall—Maiden Blush, Wealthy.

Early Winter—Grimes Golden, Jonathan, Stayman Winesap, Delicious.

Late Winter—Willow, Rome Beauty, Salome.

Crab Apples
Hyslop, Transcendent.

Peaches
Early Wheeler, Greensboro, Belle, Champion, Mountain Rose, Crawford, J. H. Hale, Elberta, Heath Cling, Salway.

Pears
Standard—Garber, Howell, Kieffer, Lawrence, Lincoln, Sheldon, Tyson.
Dwarf—Duchess.

Plums
Abundance, Burbank, Damson, DeSoto, Pottawatamie, Red June, Wild Goose.

Quince
Champion, Orange.

Cherries
Dyehouse, Early Richmond, Montmorency, English Morello.

Blackberries
Snyder, Eldorado, Mersereau.

Raspberries
Red—Cuthbert, King. Black—Cumberland, Plum Farmer. Purple—Columbian, Shafer, Royal.

Strawberries
Aroma, Brandywine, Dunlap, Haverland (pistillate), Gandy, Dr. Burrill, Progressive (everbearing).

Grapes
Brighton, Diamond, Moore's Early, Worden, Concord, Niagara, Woodruff Red.

Gooseberries
Downing, Oregon Champion, Industry.

Currants
Fay's Prolific, Perfection (red), White Grape, Boskoop Giant (black), Lee's Prolific.

Varieties of Fruits for Southern Illinois

Apples
Summer—Early Harvest, Yellow Transparent, Chenango, Benoni, Sweet Bough, Oldenburg (Duchess), Red June.

Early Fall—Maiden Blush, Wealthy.
Late Fall and Early Winter—Jonathan, Grimes, (Grimes' Golden), Delicious, Kinnaird.
Winter—Rome, (Beauty), Akin, York Imperial, Winesap, Willow.

Pears
Kieffer, Garber.

Peaches
For Family use—Greensboro, Belle of Georgia, Champion, Mountain Rose, Elberta, Hale, Oldmixon (free and cling), Reeve's Favorite, Heath Cling, Stump, Smock, Lemon Cling.
For Market—Greensboro, Belle of Georgia, Elberta, J. H. Hale, Ede, Smock.

Cherries
Dyehouse, Richmond, Montmorency.

Plums
Wild Goose, Miner, Shipper's Pride, Shropshire Damson, Blue Damson, Abundance, Burbank.

Quinces
Rea (early), Orange (medium), Meech (late).

Grapes
Black—Worden, Wilder, Ives, Concord, Moore's Early, Goethe, Eclipse.
Red—Salem, Brighton.
White—Niagara.

Blackberries
Snyder, Eldorado, Mersereau.

Raspberries
Red—Miller, King. Black—Cumberland.

Gooseberries
Downing, Oregon Champion.

Currants
Cherry, Perfection, Fay's Prolific.

Strawberries
Dunlap, Klondike, Bubach, Haverland (pistillate), Aroma, Gandy, Progressive (everbearing).

Varieties of Vegetables Recommended for Home Gardens in Illinois

Asparagus—Palmetto.
Beans (Snap)—Stringless Green Pod, Maule's Profusion, Saddleback Wax.
Beans (Lima)—Henderson's Bush Lima, Dreer's Bush Lima.
Beets—Crosby's Egyptian.
Cabbage—Early Jersey Wakefield, Copenhagen Market, Corn Belt.
Carrots—Early Scarlet Horn, Chantenay.
Cauliflower—Burpee's Dry Weather.
Celery—Golden Self-blanching, Giant Pascal.
Chard—Lucullus.
Sweet Corn—Golden Bantam, Golden Giant, Howling Mob, Stowell's Evergreen.
Cucumber—Improved White Spine, Davis Perfect, Chicago Pickle.
Eggplant—Black Beauty, New York Improved Spineless.
Endive—Broad-leaved Batavian, Green Curled.
Kale—Dwarf Green Curled.
Kohlrabi—Early White Vienna.
Leek—London Flag.
Lettuce—Black-seeded Simpson, May King, Hanson.
Muskmelon—Rust Resistant Pollock No. 10-25, Tip Top.
Watermelon—Cole's Early, Tom Watson.
Okra—Perkin's Long Pod.
Onion (Sets)—Yellow Bottom, Egyptian or Perennial.
Onion (Seed)—Southport Yellow Globe, Australian Brown, Prize Taker.
Parsley—Extra Dark Moss Curled.
Parsnip—Improved Guernsey.
Peas—Alaska, Little Marvel, Carter's Daisy.
Pepper—Neapolitan, Ruby King.
Potato—Triumph, Early Ohio.
Radish—Early Scarlet Turnip, White Icicle, Cincinnati Market, White Strassburg, White Chinese (Winter).
Rhubarb—Chicago Giant.
Salsify—Sandwich Island Mammoth.
Spinach—Victoria, Long Standing, New Zealand.
Squash—Giant Summer Crookneck, Fordhook, Table Queen, Hubbard.

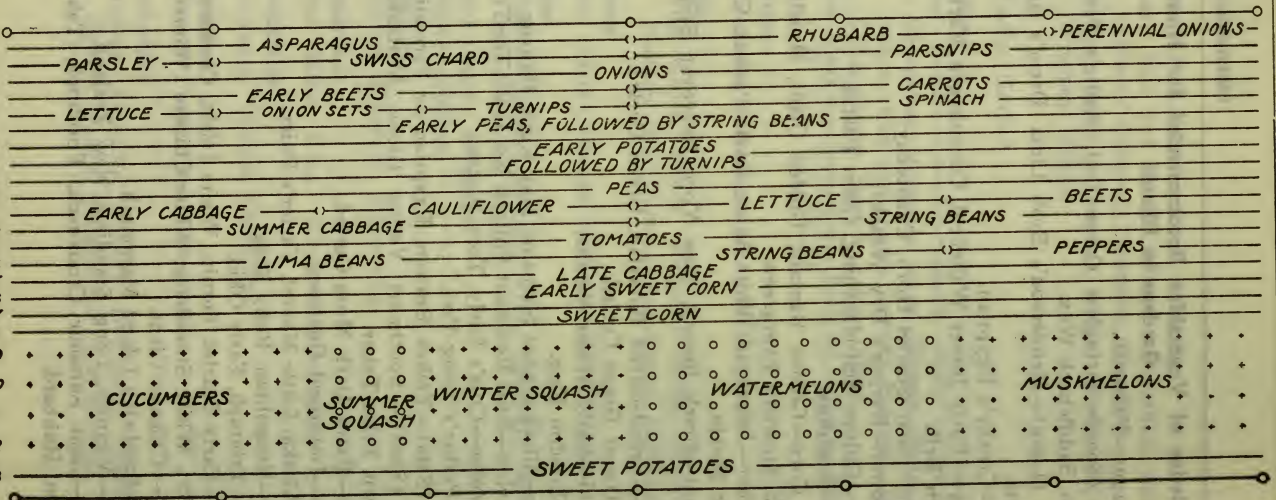


DIAGRAM OF A FARMER'S VEGETABLE GARDEN 90 BY 240 FEET

Sweet Potatoes—Yellow Jersey, Nancy Hall.

Tomato—Bonny Best, Early Detroit, Illinois Wilt-resistant Strains of New Century and Imperial.

Turnip—White Globe, Purple Top Strap-leaved.

It is recommended that every farmer grow at least ten different kinds of vegetables for his own use. The following is a list of ten vegetables that are comparatively easy to grow almost anywhere in the State:

Irish Potatoes	Snap Beans
Tomatoes	Peas
Cabbage	New Zealand Spinach
Lettuce	Beets
Sweet Corn	Parsnips

Dates for Planting Vegetables

Seasons vary greatly, but under ordinary conditions in central Illinois, the following schedule of planting dates for garden vegetables will be a safe guide. For the extreme southern part of the state the dates would be about two weeks earlier, and for the extreme northern part about two weeks later, except for groups 6 and 7, which would be planted later in southern Illinois to get the benefit of the cool fall weather.

1. Plant as early as the ground can be worked in spring (usually between March 20 and April 1, or when oats are being seeded): Leaf lettuce, spinach, radishes, turnips, smooth-seeded peas, onions (both seed and sets), leeks, kale, potatoes.

2. Plant about April 10 to 15: Beets, carrots, parsnips, parsley, salsify, Swiss chard, New Zealand spinach, wrinkled peas, transplant early cabbage and cauliflower.

3. Plant about May 1: String beans, early sweet corn.

4. Plant about May 15, or at the height of the corn planting season: Lima beans, cucumbers, muskmelons, watermelons, squashes, okra, transplant tomatoes and peppers.

5. About June 1: Transplant sweet potatoes and eggplant.

6. June 15 to July 1: Transplant late cabbage and celery.

7. Plant about August 10: Late turnips, winter radishes, winter onions (sets) (Egyptian or Perennial), endive (transplanted).

The dates given for groups 1 to 4 have reference to the first or earliest planting of the respective crops. In the case of some of these crops later plantings may also be made for the sake of securing a succession. This is especially desirable with vegetables that have a short period of edibility, such as radishes, peas, snap beans, and sweet corn.

Ornamental Shrubs and Trees

Trees for Shade and Lawn

Norway Maple
Sugar Maple
American Elm
White Ash
Green Ash
Liquidamber
Oriental Plane or Sycamore
Horse Chestnut
American Linden
Mountain Ash
Pin Oak

Trees for Special Ornamental Purposes

Fringe Tree
Red Bud
English Hawthorn
Flowering Peach, Plum and Apple
Magnolia
Purple Beech
Dogwood, white and pink
Weeping Willow
Spruce
Fir
Arborvitae
Cedar
Red Flowering Horse Chestnut

Ornamental Shrubs

Japanese Barberry—Height, low; color, yellow; time of bloom, April.

Weigelia—Height, med.; color, pink, red or white; time of bloom, last of May to first of June.

Burning Bush (Evonymus)—Height, med.; color, good fall color.

Golden Bell (Forsythia)—Height, med.; color, yellow; time of bloom, last of March.

Bush Dogwood, red and yellow branches—Height, high; color, white; time of bloom, last of May.

Japanese Rose (R. rugosa)—Height, med.; color, red, white, pink; time of bloom, last of May thru summer.

Prairie Rose (R. setigera)—Height, med.; color, pink; time of bloom, July.

Elder—Height, high; color, white; time of bloom, June-July.

Spiraea, Thunberg's—Height, low; color, white; time of bloom, April.

Spiraea, Van Houtte's—Height, med.; color, white; time of bloom, May.

Missouri Currant—Height, med.; color, yellow; time of bloom, April.

Rose of Sharon—Height, high; color, red, white, pink, var.; time of bloom, August.

Hydrangea—Height, med.; color, cream; time of bloom, summer flowering.

Bush Honeysuckle (Lonicera tatarica)—Height, high; color, pink and white; time of bloom, May first. (Lonicera morrowi) — Height, med.; color, white; time of bloom, last of May.

Mock Orange (Philadelphus) — Height, high; color, white; time of bloom, last of May.

Smoke Bush—Height, high; time of bloom, middle of June.

Snowberry—Height, low; color, pink, inconspicuous; time of bloom, May, fall berries.

Japanese Snowball—Height, high; color, cream; time of bloom, last of May.

Deutzia, scabra, P. of R.—Height, high; color, white to pinkish; time of bloom, last of May to first of June.

Deutzia gracilis—Height, low; color, white to pinkish; time of bloom, last of May to first of June.

Deutzia Lemoinei—Height, low; color, white to pinkish; time of bloom, last of May to first of June.

Indian Currant or Coral Berry—Same as Snowberry.

Lilacs—Height, high; color, according to variety; time of bloom, early May thru middle of June.

Viburnums—Height, high; color, according to variety; time of bloom, first to last of May.

Viburnum opulis—Color, cream; good fruit.
Viburnum lentago—Color, cream; time of bloom, May; good fruit in fall.
Viburnum opulis sterilis—Color, cream.
Viburnum molle—Color, cream; time of bloom, last of May.

Vines

Woodbine	Boston Ivy
Clematis, Virgin's Bower	Honeysuckle, Hall's Jap.
Clematis, Jackmanii	Bitter Sweet
Wistaria	Trumpet Creeper
Wild Grape	Morning Glory

Herbaceous Plants

Bleeding Heart	Lilies
Columbines	Oriental Poppies
Chrysanthemums	Garden Phlox
Coreopsis	Yucca
Gas Plant	Peonies
Gaillardia	Mallows
Foxglove	Golden Glow
Hollyhock	Anemone
Iris	Sweet William
Larkspur	Veronica

Annual Flowers

Sweet Pea	Aster
Cosmos	Four o'Clocks
Nasturtium	Zinnia
Bachelor's Buttons	Candytuft
Pansy	

Types of Farming in the United States

Classification of Farms in the United States in 1899 by Principal Source of Income. At Least 40 Per Cent of the Income Was Derived from the Given Source*

Chief Source of Income	Number of Farms	Per Cent of All Farms
Livestock	1,564,515	27
Hay and Grain	1,319,854	23
Cotton	1,071,545	19
Dairy Produce	357,544	6
Vegetables	155,788	3
Tobacco	106,250	2
Fruits	82,060	1
Sugar	7,174	0.1
Flowers and Plants	6,159	0.1
Rice	5,217	0.1
Nursery Products	2,029	0.04
Miscellaneous (no product equal to 40 per cent)	1,059,237	19
	5,737,372	

*Twelfth Census of the United States, 1900, Vol. V, Part I, p. liii. Alaska and Hawaii omitted. Latest data available.

G. F. Warren "Farm Management"—Table 19.

Size of Farm Related to Profits

586 Farms, Tompkins County, New York

Acres	Number of Farms	Average Size (acres)	Average Tillable Area (acres)	Labor Income
30 or less	30	21	18	$168
31–60	108	49	38	254
61–100	214	83	60	373
101–150	143	124	88	436
151–200	57	177	117	635
Over 200	34	261	160	946
Average of 586 Farms		103		$415

G. F. Warren "Farm Management"—Table 36.

Size of Farm Related to Acres per Horse, Investment in Machinery, and Crop Yields

586 Farms Operated by Owners—Tompkins County, New York

Acres	Average Size (acres)	Acres per Horse	Investment in Machinery per Acre	Yield per Acre: Oats Bushels	Potatoes Bushels	Hay Tons
30 or less	21	15	$5.95	35	117	1.38
31–60	49	21	4.96	32	111	1.36
61–100	83	30	4.11	32	119	1.33
101–150	124	37	3.99	34	114	1.35
151–200	177	41	3.34	32	127	1.24
Over 200	261	49	3.50	35	113	1.24
Av. of 586 Farms	103	33	$3.95			

G. F. Warren "Farm Management"—Tables 46, 47, 48 and 52 combined.

Showing the Effect of Crop Rotations On the Distribution of Horse Labor

Calculations Based On the 5-Year Average Horse Labor Requirements by Months of Hancock County Farms

Hours of Horse Labor for Various Rotations

Poor Horse Labor Distribution Due to Poor Cropping System
Corn 60%—Oats 25%—Mixed Hay 5%—Pasture 10%

(No Fall Work)	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Corn—120 acres	40	682	1222	1100	476	6	22	84	662	470
Oats—50 acres	230	310			220	105	20	30		
Hay (mixed)—10 acres					49	20				
Pasture—20 acres										
Total—200 acres	270	992	1222	1100	745	131	42	114	662	470

A Good Horse Labor Distribution Using Fall Work in Preparation for Corn
Corn 40%—Oats 20%—Wheat 20%—Clover 10%—Clover Pasture 10%

	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Corn—80 acres	16	344	640	600	328	137	200	384	592	360
Oats—40 acres	184	248			176	84	16	24		
W. Wheat—40 acres				44	192	452	440	396		
Clover—20 acres				108	132					
Pasture—20 acres										
Total—200 acres	200	592	640	752	828	673	656	804	592	360

Size of Farm and Crop Acres per Horse

Acres	Number of Farms	Average Size	Av. No. of Crop Acres	Crop Acres per Horse
Under 160	81	111.2	87.4	14.69
160–199	107	167	137.6	17.59
200–239	47	209.7	172.1	18.86
Over 240	81	299.6	240	21.38
Total	316			

Average crop acres per horse on 316 Central Illinois farms, 18.56.

Average Annual Hours of Labor per Acre Required in Producing Field Crops, 1902-1912

Crop	Average of All Farms Hours per Acre Man	Horse
Wheat, shock-threshed	12.3	29.9
Oats, shock-threshed	13.5	28.9
Barley, shock-threshed	12.8	29.9
Fall rye, shock-threshed	10.3	27.2
Flax, stack-threshed	13.7	33.8
Corn, husked	26.2	54.2
Fodder corn, cut, shocked, and stacked	30.4	52.6
Ensilage	32.6	59.8
Potatoes, machine production	44.4	75.0
Mangels*	180.7	99.3
Hay, timothy and clover, first crop	12.3	13.0
Hay, timothy and clover, two cuttings	20.7	21.5
Hay, wild	12.2	16.9
Timothy, cut for seed	5.1	7.1
Clover, cut for seed	9.2	12.3
Hay, millet	17.3	39.1
Hemp	14.3	27.4

*Grown at Minnesota Experiment Station.
Minnesota Bulletin 179—Table IV.

Labor Requirement per Acre of Farm Crops

Kinds of Work	Corn (679.7 acres) Man-hours	Horse-hours	Soybeans (95.5 acres) Man-hours	Horse-hours	Cowpeas (68 acres) Man-hours	Horse-hours
Preparation and Planting	7.67	19.72	6.74	16.91	10.45	26.02
Cultivating	7.90	13.44	8.10	9.18	3.31	5.16
Harvesting	8.35	9.16	9.89	10.22	10.49	8.88
Total	23.92	42.32	24.73	36.31	24.25	40.06

	Oats (263.6 acres) Man-hours	Horse-hours	Wheat (186 acres) Man-hours	Horse-hours
Preparation and Planting	4.37	12.10	5.70	14.34
Harvesting	6.46	7.38	6.08	7.03
Total	10.83	19.48	11.78	21.37

Missouri Bulletin 125—Table 13.

Labor Required by Crops*

Monthly Distribution of Man Labor (Hours per Acre)

	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Total Hours
Corn	.1	1.2	2.8	3.7	1.9			.4	2.9	2.1	.5	15.60
(Fall work)						.5	1.1	1.5	.5	.2	.2	4.0
Oats	1.4	1.9			3.4	1.9	.4	.5				9.5
Wheat				.6	3.1	.9	.5	.6				5.7
(Fall work)						3.6	3.6	2.7				9.9
Alfalfa		.5	1.7	4.9	4.8	2.8	1.6	.5				16.8
Clover				3.6	4.8							8.4

Monthly Distribution of Horse Labor (Hours per Acre)

Corn	.2	4.3	8.0	7.5	4.1			.6	5.4	3.7	.8	34.6
(Fall work)						1.7	2.5	4.2	2.0	.8	.3	11.5
Oats	4.6	6.2			4.4	2.1	.4	.6				18.3
Wheat				1.1	4.8	.8	.2	.6				7.5
(Fall work)						10.5	10.8	9.3				30.6
Alfalfa		.9	1.9	6.5	6.6	4.9	2.9	.5				24.2
Clover				5.4	6.6							12.0

*Note—In planning rotation, use the above tables as basis of labor distribution for component crops.
U. of I., Unpublished Data—Hancock County.

Labor Required per Bushel in Threshing Grain

Crop	Group	Shock-Threshed Yield	Shock-Threshed Farm Labor	Shock-Threshed Threshers' Labor	Shock-Threshed Total Labor	Stacked and Stack-Threshed Yield	Stacked and Stack-Threshed Farm Labor	Stacked and Stack-Threshed Threshers' Labor	Stacked and Stack-Threshed Total Labor
		Bu.	Min.	Min.	Min.	Bu.	Min.	Min.	Min.
Wheat	Northfield	15.0	1.6	7.5	9.1	15.8	10.5	3.8	14.3
Wheat	Marshall	18.9	1.3	7.5	8.8	13.3	13.0	3.8	16.8
Wheat	Halstad	15.5	1.4	7.5	8.9	13.5	11.5	3.8	15.3
Oats	Northfield	32.8	1.0	4.1	5.1	39.1	5.0	2.3	7.3
Oats	Marshall	38.8	.9	4.1	5.0	33.5	6.1	2.3	8.4
Oats	Halstad	29.9	.6	4.1	4.7	25.7	5.5	2.3	7.8

Minnesota Bulletin 157—Table 31.

Labor Requirements for Hauling and Spreading Limestone

The man labor and horse labor required for hauling and spreading are as follows:

		Man Labor	Horse Labor
(a)	Hauling per ton mile.....	.55 hours	1.1 hours
	Spreading per ton	.7 hours	2.0 hours

The above figures are an average of several farms to which limestone was hauled a distance of from 1 to 6 miles and spread at the rate of 2 to 4 tons per acre. Some of this limestone was hauled directly from the railway to the farm and spread, while some was piled on the fields and spread later.

The following table shows the number of man hours and horse hours required for both hauling and spreading from 1 to 5 tons of limestone at a distance of from 1 to 4 miles from railway station.

(a) A "ton mile" means hauling one ton one mile.

TABLE I

No.	1 Mile		2 Miles		3 Miles		4 Miles	
Tons	Man	Horse	Man	Horse	Man	Horse	Man	Horse
1	1.2	3.1	1.8	4.2	2.3	5.3	2.9	6.4
2	2.5	6.2	3.6	8.4	4.7	10.6	5.8	12.8
3	3.7	9.3	5.4	12.6	7.1	15.9	8.7	19.2
4	5.0	12.4	7.2	16.8	9.4	21.2	11.6	25.6
5	6.2	15.5	9.0	21.0	11.7	26.5	14.5	32.0

The Cost of Hauling and Spreading Limestone

The cost of hauling and spreading one ton of limestone, using different rates of man and horse labor, is shown in the following table. The costs are based upon the hours used as shown in Table I.

TABLE II

Rate per Hour		1 Mile		2 Miles		3 Miles		4 Miles	
Man	Horse	Man	Horse	Man	Horse	Man	Horse	Man	Horse
$.15	$.07½	$.19	$.23	$.27	$.31	$.35	$ .40	$ .43	$ .48
.20	.10½	.25	.33	.36	.44	.47	.56	.58	.67
.25	.13	.31	.40	.45	.55	.59	.69	.72	.83
.30	.16	.37	.50	.54	.67	.70	.85	.87	1.02
.35	.20	.44	.62	.63	.84	.82	1.06	1.01	1.28

U. of I.—Unpublished Data.

Cost of Producing Corn—Hancock County

Year	Farm	Yield per Acre, Bushel	Cost per Acre	Cost per Bushel
1913	1	43.6	$17.77	$ .407
1913	2	28.5	15.83	.555
1913	3	42.0	23.87	.567
1913	4	30.7	15.85	.515
1914	1	16.9	17.11	1.01
1914	2	17.3	15.73	.911
1914	3	29.4	24.04	.823
1914	4	16.4	18.60	1.13
1914	5	27.2	25.77	.947
1914	6	14.5	15.27	1.05
1915	1	36.5	18.69	.511
1915	2	45.0	15.53	.345
1915	3	50.8	23.81	.468
1915	4	60.4	24.08	.40
1915	5	45.5	26.36	.58
1915	6	43.2	17.41	.402
1916	1	48.3	19.90	.41
1916	2	25.2	15.41	.611
1916	3	51.2	22.33	.512
1916	4	36.8	20.00	.523
1916	5	23.3	18.71	.80
1916	6	30.6	15.55	.508
1916	7	19.3	19.53	1.02
1917	1	41.5	20.22	.487
1917	2	50.3	20.65	.410
1917	3	46.6	24.57	.526
1917	4	30.4	18.85	.619
1917	5	28.5	15.48	.543
1917	6	58.2	22.22	.381
1917	7	29.4	21.29	.723
1917	8	33.8	24.58	.727
1918	1	28.1	19.29	.686
1918	2	35.3	22.17	.626
1918	3	42.7	26.48	.62
1918	4	42.9	21.14	.492
1918	5	29.2	20.36	.696
1918	6	37.9	21.67	.57
1918	7	13.8	25.51	1.85
1918	8	33.4	22.97	.68
1919	1	49.5	22.24	.448
1919	2	53.4	23.05	.4316
1919	3	43.7	28.42	.649
1919	4	62.08	25.27	.407
1919	5	32.25	27.53	.853
1919	6	58.19	27.60	.474
1919	7	33.13	21.45	.647
1919	8	48.98	26.91	.5495
1919	9	53.97	28.24	.523

U. of I.—Unpublished Data.

Cost of Producing Corn—Franklin County

Year	Farm	Yield per Acre, Bushel	Cost per Acre	Cost per Bushel
1913	1	8.2	$28.51	$3.44
1913	2	14.4	15.57	1.08
1913	3	18.4	9.01	.49
1913	4	18.7	29.94	1.33
1914	1	....	....	....
1914	2	8.6	9.28	1.07
1914	3	17.3	21.74	1.26
1914	4	3.4	10.13	2.99
1914	5	5.9	15.96	2.71
1915	1	7.37	11.81	1.60
1915	2	12.8	14.88	1.15
1915	3	25.7	13.37	.52
1915	4	24.5	24.55	.52
1915	5	26.0	14.20	.545
1915	6	18.8	15.92	.85
1915	7	21.9	13.38	.61
1916	1	....	.....	....
1916	2	25.8	13.56	.524
1916	3	31.8	13.13	.412
1916	4	....	.....	....
1916	5	19.3	11.95	.62
1916	6	24.4	17.65	.72
1916	7	22.7	15.46	.68
1916	8	20.0	11.20	.56
1917	1	40.7	15.06	.369
1917	2	57.9	23.11	.39
1917	3	36.3	25.71	.708
1917	4	23.8	11.60	.486
1917	5	33.5	21.59	.644
1917	6	37.2	10.77	.289
1917	7	16.3	19.12	1.66
1917	8	34.2	19.88	.58
1918	1	8.2	24.42	2.95
1918	2	17.8	21.16	1.19
1918	3	....	.....	....
1918	4	20.8	25.46	1.22
1918	5	35.0	11.36	.33
1918	6	16.6	26.89	1.61
1918	7	10.0	28.08	2.78
1918	8	11.9	17.49	1.46
1919	1	18.59	35.58	1.91
1919	2	16.7	29.05	1.74
1919	3	44.4	23.86	.536
1919	4	6.25	33.38	5.34
1919	5	20.62	24.03	1.165
1919	6	17.1	20.68	1.21
1919	7	26.	18.76	.72

U. of I.—Unpublished Data.

Cost of Producing Standard Farm Crops

Hancock County—1913-1918, Inclusive

Acre Basis

	Corn	Oats	Fall Wheat	Clover	Timothy and Mixed Hay
Man Labor	$ 3.57	$ 1.93	$ 2.67	$ 1.98	$ 1.41
Horse Labor	5.39	2.42	4.18	1.67	1.18
Seed	.42	1.34	1.30	.38	.10
General Farm Expense	2.11	1.14	1.85	1.12	.81
Machinery	.81	.62	1.09	.59	.43
Miscellaneous	.45	.33	1.15	.47	.08
Threshing and Twine		1.36	1.14	.10	
Land	7.34	7.50	7.25	7.40	7.80
Total	$20.09	$16.64	$20.63	$13.71	$11.81
Man hours	19.6	9.5	15.6	8.4	7.8
Horse hours	46.1	18.3	38.1	12.0	8.48

University of Illinois—Unpublished Data.

Cost of Horse Labor

Hancock County

Items of Cost Making Up the Total Cost of Keeping Horses

	Feed	Labor	Interest	Shelter	Harness	Misc.	Total
1913	$ 59.27	$11.88	$8.58	$3.73	$3.24	$1.09	$ 87.79
1914	59.19	10.69	8.72	2.91	3.36	2.22	87.09
1915	65.90	11.85	8.43	3.39	4.27	2.18	96.02
1916	63.73	10.66	7.24	2.87	3.16	2.50	90.16
1917	103.18	11.80	7.79	2.91	3.72	1.54	130.94
1918	122.14	13.66	8.78	3.29	3.75	4.96	156.58
1919	109.83	13.02	3.50	7.77	4.29	1.90	140.31

The item of depreciation does not appear because the increase in the value of young horses and colts more than offsets the decrease in value of the older horses.

Showing the Percentage of the Total Cost of Keeping Horses, Made Up by Different Items

	Feed per cent	Labor per cent	Interest per cent	Shelter per cent	Harness per cent	Misc. per cent
1913	67.5	13.5	9.8	4.3	3.7	1.2
1914	68.0	12.3	10.0	3.3	3.9	2.5
1915	68.7	12.3	8.8	3.5	4.4	2.3
1916	70.7	11.8	8.0	3.2	3.5	2.8
1917	78.8	9.0	6.0	2.2	2.8	1.2
1918	78.0	8.7	5.6	2.1	2.4	3.2
1919	78.27	9.28	5.54	2.5	3.06	1.35

Variations in Horse Labor Efficiency

Hancock County

Year	Crop Acres per Horse			Hours per Horse per Year			Cost per Hours of Horse Labor		
	Lowest	Highest	Average	Lowest	Highest	Average	Lowest	Highest	Average
1913	12.9	25.1	17.5	543	1582	943	.052	.152	.097
1914	10.7	21.7	16.7	436	1353	818	.057	.210	.125
1915	16.3	30.9	22.4	781	1400	1046	.054	.168	.103
1916	14.3	29.	19.8	557	1210	923	.073	.137	.103
1917	17.7	29.4	22.4	573	1321	926	.112	.257	.143
1918	16.1	26.9	23.1	724	1273	1020	.128	.231	.162
1919	14.7	26.8	21.5	684	1216	898	.109	.193	.154

Proportions of Horse Labor Used by Various Departments of the Farm
Hancock County

	Per Cent
Livestock	4.9
Household	6.1
Equipment (Buildings and Machinery)	5.7
Miscellaneous	12.3
Field Work (crops)	71.0
	100.0

Depreciation of Farm Machinery

Machine	Average Per Cent Annual Depreciation of Farm Machinery	Average Values of Farm Machinery Consumed per Acre Annually 1913-1917
	Per Cent	
Grain binder	6.68	$0.239
Grain drill	7.15	.155
Fanning mill	7.55	.039
Smut mill	7.38	.019
Seed cleaner	6.55	....
Wild-oat mill	7.14	....
Grain tank	4.96	.012
Separator	6.78	....
Corn grader	10.85	....
Corn binder	7.8	.497
Corn planter	7.93	.181
Corn cultivator	6.83	.281
Corn sheller	8.77	....
Hay mower	7.49	.247
Hay rake	6.8	.136
Hay loader	6.17	.119
Hay tedder	6.64	.092
Hay stacker	10.36	.234
Forks, ropes, etc.	5.18	.082
Stack covers	8.42	....
Gang plow	7.21	....
Sulky plow	7.17	....
Walking plow	8.32	....
Breaking plow	6.01	....
Disc plow	23.41	....
Harrow	6.14	.029
Disk	7.93	.085
Wagon	5.58	....
Sled	6.91	....
Racks	10.52	....
Manure spreader	10.25	1.011
Silage cutter	6.87	1.237
Harness, heavy	6.65	....
Cream separator	7.44	....
Gasoline engine	10.59	....
Gasoline tractor	16.52	....
Incubator	7.06	....
Weeder	4.35	....
Corn husker	8.84	1.709
Grass seeder	3.85	....
Potato cutter	11.87	.06
Potato treater	10.0	....
Potato planter	8.16	.537
Potato sprayer	7.08	.376
Potato digger	6.81	.781
Potato sorter	6.21	....
Potato cultivator	....	.281
Plow	....	.152

Minnesota Bulletin 179—Tables 12 and 13.

Summary of Tractor Survey

	1918 Average of 100 Farms in East Central Illinois	1919 Average of 200 Farms in East Central Illinois	1919 Average of 50 Farms in Southern Illinois	1919 Average of 60 Farms in West Central Illinois
ACREAGE				
Size of farm	294	285	237	251
Crop acres	246	230	177	177
Average increase since getting tractor	...	14	11	3
Corn acres	120	108	38	79
Oats	76	65	19.5	41
Spring wheat	...	6	.....	1
Winter wheat	27	35.3	101.5	29.7
Hay	23	15.7	18	26.3
MAN LABOR				
Number of men	...	2.6	2.51	2.335
Number of men before getting tractor	...	2.66	2.534	2.403
Crop acres per man	...	88.48	70.6	76
Crop acres per man before getting tractor	...	81.29	65.6	72.4
Per cent of man labor displaced	...	8.13%	7.04%	4.74%
HORSE LABOR				
Number of horses	9.135	8.76	6.26	7.133
Number of horses before getting tractor	11.515	10.83	8.44	9.8
Crop acres per horse	27	26.25	28.3	24.9
Crop acres per horse before getting tractor	21.4	19.95	19.7	17.8
Per cent of horses displaced	20.67%	24%	30.4%	28.6%
Number of foals raised per farm 1919	...	.82	.28	.53
Number of foals raised before getting tractor	...	1.38	.4	1.317
Per cent decrease	...	40.2%	30%	59.7%

Summary of Tractor Survey

	1918 Average of 100 Farms in East Central Illinois	1919 Average of 200 Farms in East Central Illinois	1919 Average of 50 Farms in Southern Illinois	1919 Average of 60 Farms in West Central Illinois
TRACTOR DATA				
Cost of tractor when bought	1134.00	1146.00	1159.00	1124.00
Years used	.....	1.67	1.998	2.06
Years of tractor farming	2.21	2.34	2.02	2.37
1. Work Done				
Plowing—acres	117	128	104	112
Disking	94	138	57	143
Harrowing	38	62	98	72
Cutting grain	29	59	36	50
Days miscellaneous traction work	1.2	1.7	.9	2
Total days traction work	24.9	30.2	21.7	27.3
Total days belt work	5.1	2.93	5.96	4.9
2. Miscellaneous				
Estimated life of tractor	.....	6.35	6.52	6.52
Hours of tractor chores	.95	.88	.96	.8
Per cent that will get another tractor	88%	92%	84%	90%

Note: The tractor survey in 1918 was made in Woodford, Tazewell, McLean, Champaign, and Moultrie Counties, principally by farm to farm visits. The 1919 tractor survey was made entirely by farm to farm visits and included the following counties: In East Central Illinois: Champaign, Vermilion, Iroquois, Ford, Piatt, DeWitt, Macon, and Logan; in Southern Illinois: Madison, and Clinton; and in West Central Illinois: Fulton, Knox, and Peoria.

Distribution of Time, by Months, at Tractor, Doubtful, and Non-Tractor Work, Reduced to a Percentage Basis

Based On 31 Farm Cost Accounting Records—1913-1917 Inclusive—Hancock County

	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tractor	11.8	53.6	64.5	22.3	5.5	13.8	13.3	11.6	9.9	2.9
Doubtful	4.1	5.3	1.2	3.7	12.4	3.4	8.6	6.3	.4	.3
Non-tractor	23.5	26.9	34.3	63.2	69.1	46.3	35.6	41.1	47.7	37.4
Total	39.4	85.8	100.0	89.2	87.0	63.5	57.5	59.0	58.0	40.6

Crops raised during the same period:

	Per Cent
Corn	48
Oats	22
Wheat	5
Rye	5
Mixed hay	16
Clovers	9

Summary of Tractor Records of Two Cost Accounting Co-Operators—1918

	Tractor 1	Tractor 2
Crop acres	194	160
Plowing—hours	121	91
Disking—hours	126	67
Harrowing—hours	32	...
Drilling—hours	8½	...
Threshing—hours	127	168
Cutting silage—hours	106	...
Total hours	520½	326
EXPENSES		
Gasoline	$ 1.60	$ 1.33
Kerosene	121.00	142.14
Oil	21.93	47.65
Repairs	44.47	130.19
Man labor	17.19	64.85
Horse labor	3.91	3.82
Interest on investment	26.00	39.58
Depreciation	340.05	122.59
Buildings expense	9.56	5.18
Miscellaneous	.....	9.66
Total	$585.71	$566.99

Tractor Summary
Farms Grouped According to Size

Group No.	No. of Farms	Average Crop Acres	Per Cent of Horses Displaced	Crop Acres per Horse		Days of Tractor Work	
				1918	Before Getting Tractor	Traction	Belt
I	22	130	24.9	24.9	18.7	17.6	3.7
II	22	177	25.4	24.9	18.5	22.8	3.4
III	22	215	28	27.5	19.8	27.8	4.3
IV	18	294	15.5	27.6	23.4	26.8	10.2
V	17	465	13.3	28.3	24.5	30.2	5.4

Data from 1918 Tractor Survey of 100 farms in East Central Illinois.

Work Done by Twenty-Four Tractors, Which Were Used to Best Advantage, Compared with Average of 100 Farms

	Average of 24 farms	Average of 100 farms
Acres plowed	143	117
Acres disced	154	94
Acres harrowed	59	38
Acres of grain cut	48	29
Days of road work	1	1.2
Total days of traction work	33	24.7
Average crop acres	259	246
Per cent of horses displaced	33.1%	20.67%

Data from 1918 Tractor Survey including 100 farms in East Central Illinois.

Tenancy Studies
Division of the Real Income as Shown by Capital and Farm Returns

	Tenant	Landlord	
Number of farms	114	114	
Average capital	$3710	$33767	
Farm income	$1470	$ 1256	
Interest at 5½ per cent*	$ 204		
Labor income		$1266	
Living furnished by the farm**		$ 485	
Landlord's per cent on investment			3.72%
Per cent annual increase in the price of Iowa land from 1850 to 1910..			4.70%
Net income of tenant		$1751	
Net income of landlord			8.42%

*Mortgage rate in Iowa for year 1912 taken from unpublished data.

**U. S. Farmer's Bulletin 635, entitled "What the Farm Contributes Directly to the Farmer's Living."

Iowa Bulletin 159—Table 6.

Division of Income Between Tenant and Owner

The University of Illinois Livestock Lease is used as a basis of dividing expenses and receipts on a typical Illinois livestock farm. This farm is operated by its owner. The division between landowner and tenant is theoretical.

Items	Cattle Farm, 1918 Returns Landowner	Tenant
Acres	320	.....
Crop acres	152.5	.....
EXPENSES		
Land interest on investment at 4%	$1541.00	.....
Buildings expense	14.90	.....
Buildings depreciation	184.85	.....
Fences	84.26	.....
Breeding fees	45.00	.....
Labor	.....	$599.25
Labor of proprietor	.....	750.00
Machinery expense	.....	80.25
Machinery depreciation	.....	155.66
Interest on personal property at 6%	312.67	494.19
Taxes	207.56	38.62
Sub total	$2390.24	$2117.97
Feed	$1815.07	$1815.07
Seed	82.75	82.75
Silo filling, threshing, etc.	55.92	55.92
Decrease in inventory	835.68	835.68
Livestock expense	115.03	115.03
TOTAL EXPENSES	$5294.70	$5022.41
RECEIPTS		
Crops	$ 123.58	$ 123.58
Livestock	7754.67	7754.67
Miscellaneous	40.08	40.08
TOTAL RECEIPTS	$7918.33	$7918.33
Total Expenses	$5294.70	$5022.41
Net Income	$2623.63	$2895.92

This farm is a beef cattle farm with rough land. The net income for the landowner and tenant is as equitable as can be expected under varying conditions.

Studies of Land Values in Iowa*

Table 1 shows the advance in the price of Iowa farm land from 1850 to March 1, 1920.

Year	Price per Acre	Advance per Acre	Percentage Increase
1850	$ 6.09	.....	.....
1860	11.91	$ 5.82	95.6
1870	20.21	8.30	69.7
1880	22.92	2.71	13.4
1890	28.13	5.21	22.7
1900	43.31	15.18	54.0
1910	96.00	52.69	121.7
1919	192.00	96.00	100.0
1920	255.00	63.00	32.8

*U. S. D. A. Bulletin 874.

Financial Organization of the Farm—Distribution of Farm Investments

Census 1910

	Land Per Cent	Buildings Per Cent	Tools and Machinery Per Cent	Livestock Per Cent
United States as a whole ..	69.5	15.4	3.1	12.0
Illinois	79.1	11.1	1.9	7.9
McHenry County, Dairy...	66.3	19.0	2.7	11.8
Hancock County, Livestock	77.0	12.1	1.8	9.1
Champaign County, Grain..	87.4	6.6	1.3	4.7
Hardin County	54.6	20.0	3.1	22.3

Index Numbers of Wholesale Prices in Specified Years and Months—1913 to October, 1920—By Groups of Commodities (1913 Price 100)

	All Commodities	Farm Products	Corn	Wheat	Oats	Food, etc.	Cloths and Clothing	Metals and Metal Products	Lumber and Building Materials	House Furnishing Goods	Chemicals and Drugs	Fuel and Lighting
1913.....	100	100	100	100	100	100	100	100	100	100	100	100
1914.....	100	103	112	105	105	103	98	87	97	99	101	96
1915.....	101	105	116	137	129	104	100	97	94	99	114	93
1916.....	124	122	133	144	120	126	128	148	101	115	159	119
1917.....	176	189	263	237	170	176	181	208	124	144	198	175
1918.....	196	220	255	235	205	189	239	181	151	196	221	163
1919.....	212	234	260	261	188	210	261	161	192	236	179	173
Jan. 1920.....	248	246	245	274	225	253	350	177	268	324	189	184
Feb. 1920.....	249	237	245	258	224	244	356	189	300	329	197	187
Mch. 1920.....	253	239	256	254	240	246	356	192	324	329	205	192
Apr. 1920.....	265	246	271	279	255	270	353	195	341	331	212	213
May 1920.....	272	244	315	305	287	287	347	193	341	339	215	235
June 1920.....	269	243	308	312	295	279	335	190	337	362	218	246
July 1920.....	262	236	265	296	272	268	317	191	333	362	217	252
Aug. 1920.....	250	222	250	267	198	235	299	193	328	363	216	268
Sept. 1920.....	242	210	235	267	176	223	278	192	318	371	222	284
Oct. 1920.....	225	182	169	234	145	204	257	184	313	371	216	282
Nov. 1920.....	207	165	141	211	138	195	234	170	274	369	207	258
Dec. 1920.....	189	144	126	192	128	172	220	157	266	346	188	236
1920.....	243	218	235	263	215	236	302	186	308	366	210	238
Jan. 1921.....	177	136	115	192	123	162	208	152	239	283	182	228
Feb. 1921.....			105	178	113							
Mch. 1921.....												

NOTE: In all, 327 commodities were included; 32 farm products, 91 foods, 77 cloths and clothing, 25 metals and metal products, 30 lumber and building materials and 12 furnishing goods. Monthly Labor Review, Feb., 1921. Index numbers for Corn, Oats, Wheat, U. of I.

Average Farm Price On December 1 for Certain Crops for Five Years (1907-1911).* Showing Comparisons With the Iowa Price as 100 Per Cent

	Corn		Wheat		Oats		Hay		Potatoes	
	Price	Per Cent of Iowa Price	Price	Per Cent of Iowa Price	Price	Per Cent of Iowa Price	Price	Per Cent of Iowa Price	Price	Per Cent of Iowa Price
**Colorado	$0.69	147	$0.85	98	$0.50	135	$ 9.67	113	$0.67	110
Nebraska	.47	100	.84	97	.37	100	7.15	83	.72	118
Iowa	.47	100	.87	100	.37	100	8.58	100	.61	100
Illinois	.49	104	.93	107	.40	108	11.62	135	.73	120
Indiana	.50	106	.94	108	.40	108	12.00	140	.68	111
Ohio	.55	117	.97	111	.43	116	12.55	146	.67	110
New York	.73	156	1.00	115	.51	138	14.71	171	.64	105
Massachusetts	.78	166	....	...	.58	157	19.40	226	.83	136

*U. S. Department of Agriculture Yearbooks, 1910 and 1911.
**Arranged geographically from west to east to show price trends.
G. F. Warren "Farm Management"—Table 5.

Average Price Received by Farmers for Butter, Eggs and Poultry (1910 and 1911).* Showing Comparisons With Iowa Price as 100 Per Cent

	Butter		Eggs		Chickens	
	Average Farm Price	Per Cent of the Iowa Price	Average Farm Price	Per Cent of the Iowa Price	Average Farm Price	Per Cent of the Iowa Price
Colorado ...	29	116	26	137	13.4	140
Nebraska ...	21	84	18	95	9.1	95
Iowa	25	100	19	100	9.6	100
Illinois	24	96	20	105	10.9	114
Indiana	22	88	21	111	10.8	113
Ohio	24	96	22	116	11.3	118
New York ..	29	116	27	142	14.4	150
Massachusetts	33	132	34	179	16.8	175

*U. S. Department of Agriculture Yearbooks, 1910 and 1911. G. F. Warren "Farm Management"—Tables 9 and 10.
Note: States arranged geographically from west to east to show price trends.

The prices are the averages for the first of each month. A farmer will receive a lower average for the total eggs or meat sold, because the largest sales come in the months of lowest prices.

Average Amounts of Commodities Consumed Annually Per Capita in the United States

	10-Year Per Capita Average	
Food Stuffs		
Cattle	.64	unit
Sheep	.53	unit
Hogs	.633	unit
Corn	27.54	bu.
Wheat	5.83	bu.
Oats	12.35	bu.
Barley	2.01	bu.
Potatoes	3.63	bu.
Rye	.42	bu.
Sugar	82.1	lbs.
Coffee	10.3	lbs.
Tea	.996	lbs.
Cocoa	2.22	lbs.
Rice	20.7	lbs.
Textiles		
Cotton	30.65	lbs.
Wool	6.25	lbs.
Silk	.37	ibs.
Miscellaneous		
Rubber	2.12	lbs.
Coal	3.91	tons
Petroleum	118.	gals.
Tobacco	11.1	lbs.

Brookmire's Trade Bulletin.

Illinois Agricultural Handbook

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